ELECTRICAL REVIEW

9th OCTOBER, 1953

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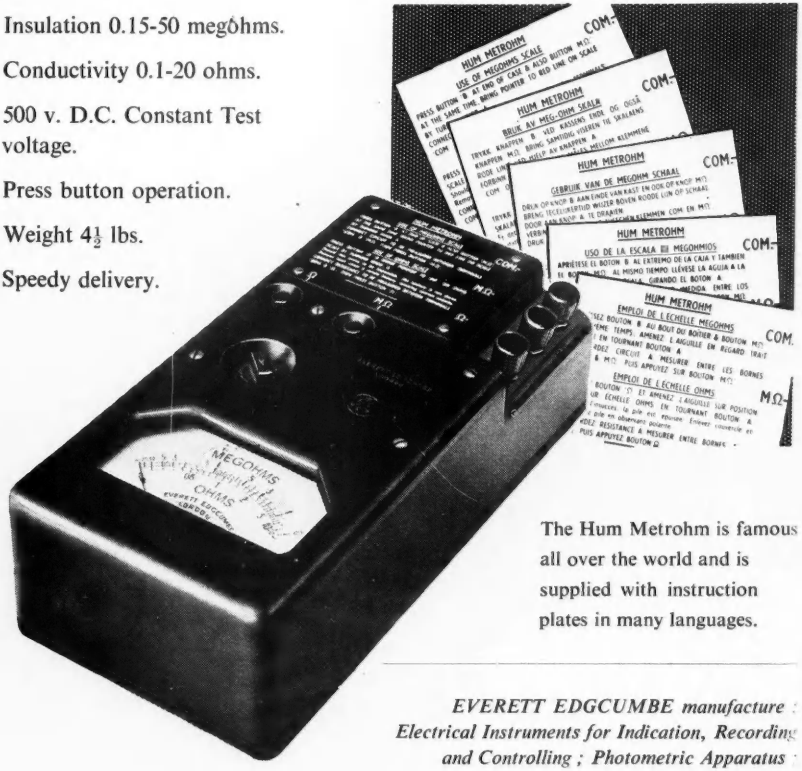

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THE OLDEST ELECTRICAL PAPER • ESTABLISHED 1872 • VOL. 153 • NO. 15

The Testing House

DURING and after the war when materials were less plentiful than they are now there appeared in the shops many strange electrical devices from anonymous makers. It seemed that these people were able to obtain materials which were denied to the regular makers of domestic electrical apparatus. These ill-constructed and dangerous appliances were cheap and the public, unable to do better, bought them and were afterwards shocked in more ways than one. It was realized that this was no good for the people or for the electrical industry and there arose a renewed demand for some system by which a check could be applied.

The matter was taken up by the British Electrical Development Association and the British Standards Institution who formed a joint Advisory Committee on Electrical Appliances and Accessories and a Testing House was set up in 1947 by E.D.A. to furnish reports to this Committee. Primarily the purpose was to test appliances submitted because there was some doubt about them, safety being the first consideration. Later, however, the Testing House was asked by manufacturers to examine new or " prototype " appliances to see if they met the Committee's requirements. Although safety remained the principal touchstone, some independent opinion on durability and fitness for purpose was also required by Electricity Boards which proposed to deal with particular appliances on a large scale. Then came the arrangement between the Canadian Standards Association and the B.S.I. for securing Canadian approval of equipment before its shipment to the Dominion. In this connection the Testing House has given valuable " dollar export " assistance. With all this work going on and increasing the quarters at Brettenham House, London, were found to be totally inadequate and the need for better and larger accommodation became imperative. The result was the erection of the excellent new Testing House at Leatherhead which was formally opened on Monday by

Sir Henry Self and is briefly described in this issue. But, commodious as the new building is, its sponsors have no doubt that the work will continue to grow and provision has therefore been made for substantial future expansion. One direction in which there is likely to be increased activity is the examination of appliances for compliance with the appropriate British Standards as a step towards securing for them the B.S.I.'s "Kite" mark. At a time when the electrical industry is endeavouring to recover lost ground in the domestic sphere it is imperative that appliances shall be safe and sound and consequently the work of the Testing House is invaluable.

HEATING DEBATE

Mr. J. I. Bernard, of E.D.A., and Mr. R. E. Gamlen have written to the *Manchester Guardian* in protest against that newspaper's attitude towards the electric fire. They both reiterate the arguments familiar to our readers—that electric fires are efficient, economical for short-term use, consume energy derived from otherwise unusable coal and unlike other forms of heating do not pollute the atmosphere. In a postscript to the letters, however, the *Guardian* refuses to budge from its position, relying on a statement in the "Fuel Conservation" report that in America electric heating is actively discouraged. It omits to mention that heating by oil or natural gas is the usual alternative there. Great Britain has to import oil at a heavy cost and has no natural gas.

RAILWAY 50 c/s SYSTEM

For many years now British engineers have been interested in the possibility of making electric railways more economical, particularly in regard to overhead equipment and substations, by using a single-phase a.c. supply at the standard frequency of 50 c/s on the contact wire. The work which has been done in this direction by the French National Railways has been watched closely and it was thought desirable to obtain some first-hand experience in this country. The existence of an isolated section of line equipped with overhead conductors between Lancaster, Morecambe and Heysham seemed to provide a suitable opportunity. As a means to obtain experimental results in the shortest possible time full advantage was taken of existing equipment and in November, 1952, less than a year after the decision to proceed with the scheme, trial running was commenced.

ELECTRIC DRIVE TRANSMISSION

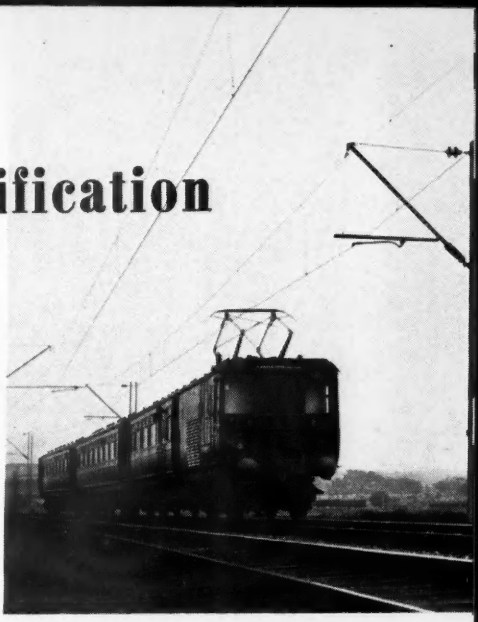
In the article under this heading in this issue we have attempted to dispel complaints of complications in respect of all forms of engine-electric drives such as, in this case, mobile cranes. Maybe those who are worried in this respect have in mind the wiring, but we have only to look at the back of a remote control board or of a contactor board in, say, a factory, or at the inside of any modern radio or television set to see that a mass of wiring properly templated does not imply complication of operation; and how often does such "static" wiring give trouble? One also hears criticism of reduced power available by use of separate motors on the motions, but if this is so then the whole advance in the past twenty years or so of individual driving has led to nothing.

DOMESTIC EQUIPMENT

Next week's "Electrical Review" will be a special issue dealing with domestic electrical equipment. It will contain schedules and illustrations of the various appliances available. The matter will be introduced by an article from Dame Caroline Haslett, D.B.E., a leading authority on electricity in the home.

Railway Electrification

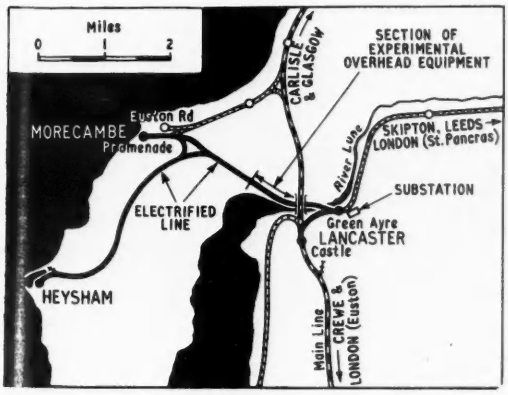
Conversion to 50 c/s Single Phase Working



THE conversion of the British Railways (London Midland Region) Lancaster–Morecambe–Heysham line to the 50 c/s single phase system was completed at the end of last year. A programme of trials has since been carried out to test the electrical equipment of the line, and to determine the effects of this system of electrification on the power supply and other services, such as telecommunications and signalling. Full electric operation of the local passenger train services was restored on 17th August last.

The line, some 9 route miles in length, was first electrified by the former Midland Railway in 1908 as an experiment to test the use for electric traction in this country of a.c. at 25 c/s, supplied at 6·6 kV to an overhead contact wire. Due to age, the original trains had to be withdrawn from service in 1951, but the overhead equipment was in good condition and suitable for use at a higher frequency. The conversion to 50 c/s working has been carried out under the direction of Mr. R. A. Riddles, member of the Railway Executive for mechanical and electrical engineering, as a joint experiment in association with British overhead equipment and electrical manufacturers. Mr. J. C. L. Train, Railway Executive member for civil and signal and telegraph engineering, was responsible for the investigations plant, cabling of the overhead telephone and signalling wires, and for modifications to track circuits. British Insulated Callender's Cables, Ltd., the English Electric Co., Ltd., and the British Electricity Authority have co-operated in the experiment.

Map of Lancaster-Morecambe-Heysham electrified line



A new substation has been built at Green Ayre Station, Lancaster, to replace the old 25 c/s motor-generator frequency conversion plant at Heysham Harbour substation. The equipment, supplied by the English Electric Co., Ltd., comprises two incoming oil circuit breakers, two

transformer oil circuit breakers, two 6·6 kV/6·6 kV type "ON" 833 kVA single-phase transformers, and two track feeder oil circuit breakers. The transformers may be operated in parallel, but will normally be used singly, one serving as a standby for the other. The track feeders have instantaneous overcurrent protection, and the other oil circuit breakers have normal protection. The transformer and track feeder oil circuit breakers are arranged for remote control from an operating panel in Green Ayre Station box, 50 yards from the substation.

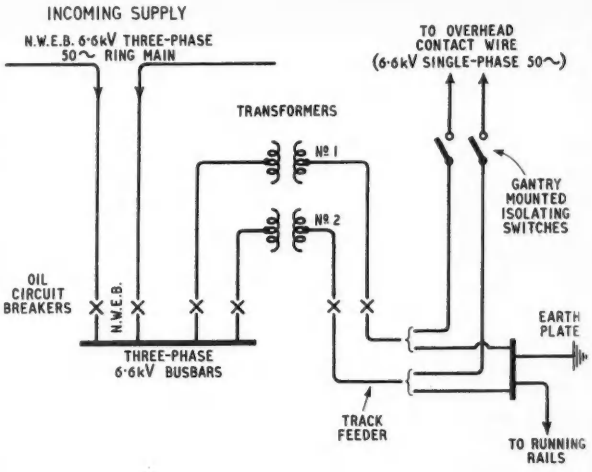


Diagram of h.v. connections at Green Ayre substation. The transformers are connected across red and blue phases at the substation busbars. The centre poles of transformer and track feeder o.c.b.'s are not used and the control wires of both up and down lines are connected solidly together throughout the system

About 4,000ft of the original two track, wood pole and steel bridge, portal construction overhead equipment between Green Ayre and Morecambe (Promenade) Stations was removed and replaced by British Insulated Callender's Cables, Ltd., by up-to-date light single track hinged cantilever construction. It is designed for 20 kV since a.c. electrification would generally be carried out at a higher voltage than the 6·6 kV originally used on the line and retained for convenience. Simple catenary construction is employed, using a 7/0116in stranded hard drawn copper catenary and a single 0·166 sq in cadmium copper contact wire, which is suspended from the catenary by $\frac{3}{16}$in semi-hard-drawn copper dropper wire. Automatic tensioning by balance weights has been adopted, and the site includes both curved and tangent track.

The line's proximity to the sea and the presence of steam traffic affords suitable conditions under which comparative tests can be made of the corrosion-resistant properties of several types of masts and protective treatments. The different types of supporting masts which have been installed include rolled steel joists, steel broad flange beams, aluminium alloy broad flange beams, lattice steel, tubular steel, pre-stressed concrete, and creosoted wood.

The methods used to protect the masts against corrosion include galvanizing; flame cleaning and painting; pickling and painting; shot blasting and metal spraying —in all, a dozen different varieties of protection have been used. Some of the hinged cantilevers are fabricated from steel angles and tees, some from steel tubes, and others from aluminium alloy sections. Pin, cap and pin, and solid core type insulators are incorporated in various cantilever arrangements.

To provide rolling stock in place of the original train sets, use has been made of three of the three-coach electric train sets made surplus by the closing to passenger traffic in 1940 of the Willesden–Earls Court line. These train sets were built by the Metropolitan Carriage, Wagon and Finance Co. in 1914 and were originally fitted with Siemens electrical equipment. Conversion of the train sets was carried out at the Wolverton Carriage and Wagon Works of the London Midland Region. Each train set comprises motor coach, trailer coach, and driving trailer coach.

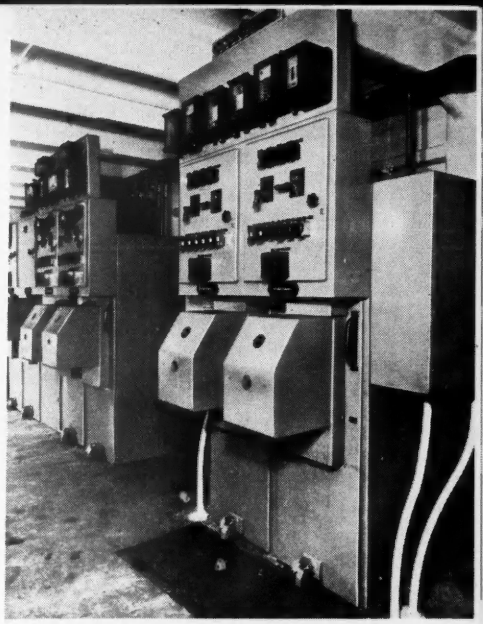
The electrical equipment has been

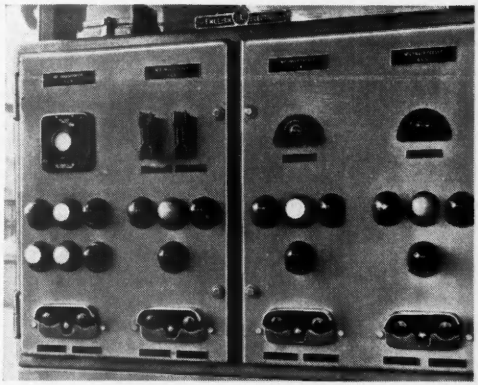
supplied and erected for experimental purposes by the English Electric Co., Ltd., using components which were readily available. It is not representative of future equipment which would be under-frame mounted to avoid loss of seating capacity.

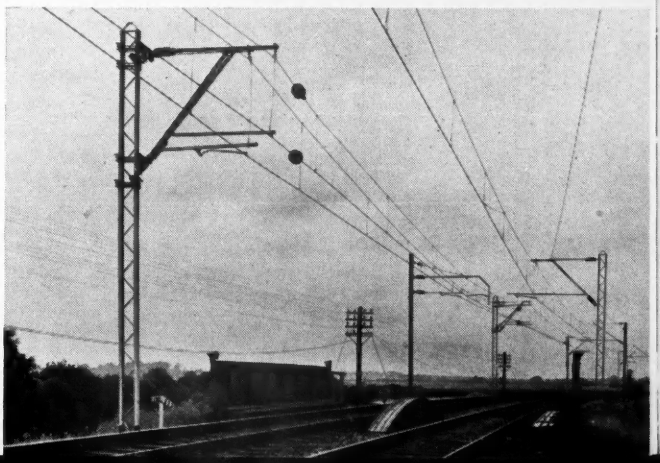
Power at 6·6 kV 50 c/s is collected from the overhead contact wire by a single pantograph and fed to the equipment compartment which contains the transformer, rectifiers, control equipment and part of the associated auxiliaries. Under the coach are the electro-pneumatic motor reverser, notching and field divert resistances, the motor driven compressor and the 24 V battery for emergency lighting of the equipment compartment. The motor coach is driven by four axle-suspended self-ventilated traction motors, which are 715 V d.c. series-wound machines, each of 215 h.p. at the one-hour rating. This rating was chosen to give an equipment capable of high acceleration for experimental purposes.

Power collected by the single pantograph is fed to the motors via a transformer and rectifiers. The transformer has a double secondary winding, each half of the winding being provided with tappings. There are two sealed steel tank air cooled mercury arc rectifiers, each having six anodes which are paralleled in groups of three. They are fitted with heaters to ensure correct operation when starting from cold and each feeds two motors connected in series with the mid-point earthed.

The transformer contains a tertiary winding, 230–0–230 V, for auxiliary services. Train lighting is supplied at 24 V through separate step-down transformers working off the 230 V supply. Train heating is obtained from the tertiary winding at 460 V. The compressor used in connection with the air brakes is driven by a standard







Top right: **Inside the new substation at Lancaster (Green Ayre)**

Centre right: **Remote control panel in Lancaster (Green Ayre) signal box**

Right: **Examples of overhead equipment**

d.c. motor supplied through a dry plate rectifier with smoothing circuit.

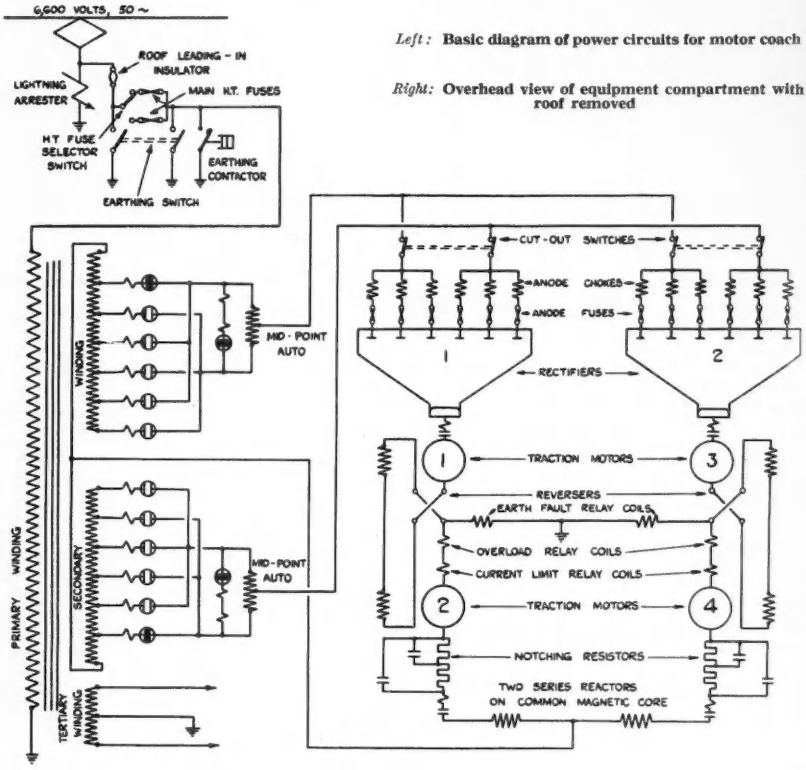
Control of the traction motors is obtained by varying the transformer secondary voltage by an on load tap-changer, consisting of two sets of cam-operated contactors and auto-transformers with mid-point tappings.

There is a h.v. fuse between the pantograph and the primary of the power transformer in the h.v. compartment, and a lightning arrestor is mounted on the roof. Overload protection is provided by over-current relays and contactors in the d.c. circuits, while there are six anode fuses for each rectifier. Some smoothing of the d.c. current is obtained by the use of a d.c. reactor consisting of two series reactors on a common magnetic core.

The power transformer already referred to is oil cooled, and the cooling circuit includes a radiator with a motor operated fan. The equipment compartment is fitted with electrically operated shutters under the control of thermostats so as to control the incoming and outgoing air flow of the compartment. Thus, the temperature of the air used for cooling the rectifiers is automatically controlled. The equipments are designed so that the train sets can be operated in multiple.

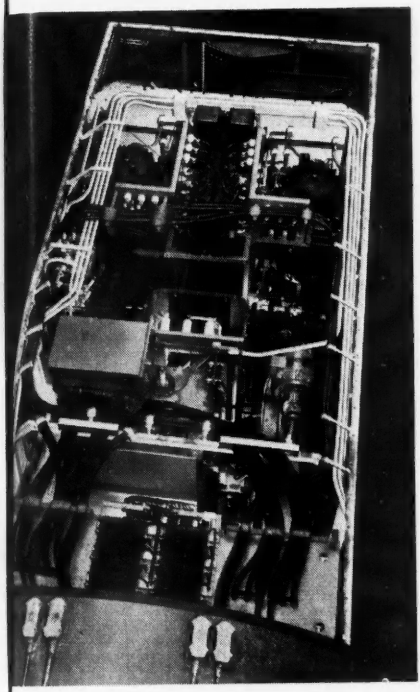
The driver's cab contains a master controller, air brake valve, driver's control and indication panel, and a cupboard for the fuses, contactors, etc., which are used in the auxiliary and control circuits. The pantograph is raised by residual air pressure in the pantograph reservoir, or failing this, by a foot pump, and contact with the overhead line energizes the rectifier transformer through the 6·6 kV fuse.

The tertiary voltage is then available for



Left: **Basic diagram of power circuits for motor coach**

Right: **Overhead view of equipment compartment with roof removed**



train lighting and heating, and also for the control supply, battery charger, compressor supply and auxiliaries. The compressor starts up under the control of its governor and rectifier heaters are energized automatically. Provided the various control supply switches are closed the driver waits for the air pressure to build up, by which time the rectifiers have warmed up.

The train is driven from the master controller in exactly the same manner as a standard d.c. equipment. The removable key is first inserted, then the master switch thrown to the " on " position, the reverser handle to " forward " or " reverse " and then the main power handle to the shunting, half voltage, full voltage, or weak field position. Acceleration is automatically controlled by a current limit relay up to whichever of the four running notches is chosen. The one hour rated output at the wheels allowing 10 per cent line drop is 850 h.p., while the one hour rated tractive effort in full field is 11,500 lb. The average accelerating tractive effort is 17,900 lb and the maximum permissible speed for the equipment is 75 m.p.h.

In changing from the previous 25 c/s installation to the 50 c/s system, the higher load current and frequency, together with the employment of rectifiers on the trains, greatly increased interference to telecommunication and signalling circuits, and tests confirmed the need to replace the overhead communications route by means of buried cable. Two separate cables are provided for telecommunications and signalling circuits respectively. Both are lead covered, double steel tape armoured and served. The conductors of the 14-pair star quad air spaced cable employed for the telecommunication circuits are 40 lb/mile and are provided with a double tape copper screen below the lead sheath. In the signalling cable the conductors are 1/0·064in in diameter with oil impregnated paper insulation, the size of cable varying along the route between 12 and 48 conductors.

The change of frequency and increased load affected the existing track circuits. There were some 30 direct current single rail track circuits working reasonably well when the maximum return traction current was low, but the increased return current of the new scheme necessitated alteration of the relays and of the feed end arrangements. The stray a.c. currents in the track circuits have been limited by the insertion of a choke in the feed end, and the relays have been altered internally by providing a magnetic shunt and copper slugging so that a.c. will not energize them.

Contact Temperatures

TESTS by the Commonwealth Edison Co., Chicago, are regarded as demonstrating that copper contacts can safely be operated in emergencies (e.g., up to five days of 8 hr periods) above the normally maximum temperature rise permissible of 30 deg C. The tests, the *Electrical World* reports, were carried out at temperatures up to 200 deg C for eighteen months in loading cycles of 16 hr heating and 8 hr cooling to determine ageing characteristics of bolted and pressed connections in joints between busbars and pressed lugs on cables. Joints became unstable at 165 deg C but no annealing or loosening of bolts was apparent when operated at 150 deg C for 900 hr. Oxidation made no appreciable difference below 165 deg in resistance or current carrying capacity of the area of high compression round the bolts.

Fluorescent Street Lighting

Many Factors in its Favour

By W. ROBINSON, B.Sc., A.M.I.E.E., F.I.E.S.*

THE present phase through which street lighting is passing might almost be described as the war of the lamps. Technique has settled down under the new Code of Practice and presents little scope for controversy, but it is becoming increasingly obvious that the codification of street lighting practice in terms of lantern luminous output and distribution leaves unsettled perhaps the most important question of all, namely, the choice of light source.

It is impossible not to agree with the proposition advanced recently by Mr. F. H. Pulvermacher† that individualism in this matter is proving detrimental to street lighting and that the time is ripe for an objective review of the various light sources available to ascertain whether there is a *best* lamp for the purpose. If there should emerge from such a review an outstanding case for any particular light source from every aspect—visibility and hence safety, amenity, financial and fuel economy —then even our traditional individualism should prove no obstacle to its widespread adoption. In this article the claims of the fluorescent lamp as the outstanding street lighting source are advanced with the intention of stimulating further discussion on this most important subject.

The following is a summary of the features of fluorescent lighting which commend it for street lighting:—

1. It provides high road visibility per lumen of lantern output as a consequence of low lantern brightness and large area of light emission. This superiority is particularly marked in wet weather when the need is greatest.

2. It gives good colour rendering and has a high amenity value.

3. Lamp life is high (5,000 hours nominal) and labour cost for replacement is low.

4. Lamp efficiency is high and continuously increasing. Since its introduction fluorescent lamp efficiency has doubled and there is no physical bar to further advances, indeed they may be regarded as a certainty.

5. The cost of lamps is relatively low and can be expected to decrease by virtue of the expanding market for them and by the scope for the reduction or elimination of purchase tax.

6. The present high cost of lanterns will not necessarily apply after the development period and substantial reductions in cost may be expected as demand increases.

7. Lanterns containing fluorescent lamps reach a temperature not greatly above atmospheric, " breathing " is reduced, and internal cleaning has been found to be less frequently needed than with lanterns enclosing tungsten or discharge lamps.

8. Fluorescent lamps can be switched separately in each lantern, enabling reduced lighting to be used after midnight without disturbing the road brightness distribution. This applies either to reflector or refractor lanterns from two lamp types upwards.

9. Fluorescent lighting lends itself very readily to non-standard or semi-decorative forms of installation such as building face lighting by horizontal or vertical lanterns, vertical column top lighting, etc.

This imposing list of qualifications places fluorescent lighting in the luxury class if we define luxury " as a thing that one enjoys " but it is remarkable how prevalent is the view that fluorescent street lighting is a luxury in the alternative dictionary sense of a " desirable thing that can be done

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* Mr. Robinson is Lighting Officer to the British Electrical Development Association but the views expressed in this article are purely personal and " unofficial."

† " Lamps for Street Lighting," *Electrical Review*, 10th July, p. 72.

without." The real question to-day is not so much " Why should we have fluorescent lighting ? " but " Why should we *not* have fluorescent lighting? " Consider, for instance, the ultimate question in street lighting, its cost in relation to the visibility produced.

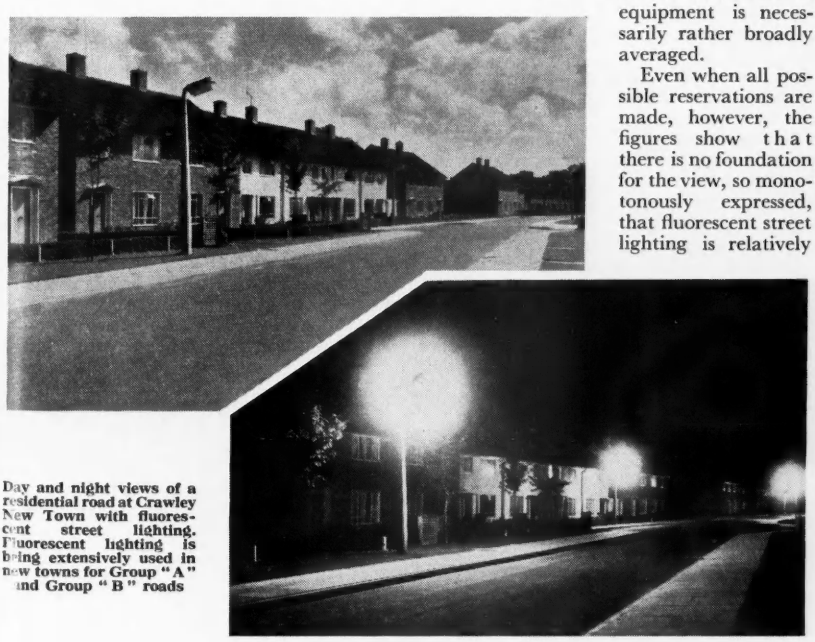
The degree of road visibility provided by any lighting installation clearly depends on many inter-related factors, such as the size, brightness and light distribution of lanterns and their spacing and mounting height. The choice of lamp—whether tungsten, mercury, sodium, or fluorescent—must, in the first place, be based on the cost of providing and maintaining a given standard of visibility since, obviously, if cost were no object, good visibility would not present insuperable problems with any light source.

A comparative analysis of light sources must, therefore, have as a basis the material requirements and hence the cost, of providing a given standard of road visibility. It is not possible to be precise on this point; visibility is not yet measurable objectively and the author can only give his own subjective opinion as a starting point, which is that a technically sound installation using 140 W sodium discharge lamps compares more than favourably with a similar installation of 250 W mercury discharge lamps and that a similarly sound installation of lanterns containing two 80 W fluorescent lamps compares very favourably with either sodium or mercury discharge lamps.

The author's opinion on this point is unlikely to pass unchallenged, and others' opinions will be welcome, but it does provide a basis for comparing the cost of fluorescent lighting relative to that of the nearest equivalent mercury or sodium lighting as has been done in the table on the next page.

This table requires caution in its interpretation as does any attempt to draw a general conclusion from a specific example. Obviously some of the costs vary with circumstances. It may, for instance, be sounder to base amortization on a 15-year period, allowing, say 10 per cent per year, as being more in line with the terms likely to be offered if capital investment restrictions were alleviated or removed; the cost of electricity also varies from place to place; the assumed cost of equipment is necessarily rather broadly averaged.

Even when all possible reservations are made, however, the figures show that there is no foundation for the view, so monotonously expressed, that fluorescent street lighting is relatively



Day and night views of a residential road at Crawley New Town with fluorescent street lighting. Fluorescent lighting is being extensively used in new towns for Group "A" and Group "B" roads

expensive; it merely costs more to buy the equipment. A similar situation was faced with equanimity when discharge lighting proved itself superior to tungsten filament lighting and it may well be asked why a similar situation in respect to fluorescent lighting should not now be faced with the same equanimity.

These facts seem, to the author at least, to be established:—

1. Fluorescent street lighting gives better visibility per lumen delivered on the road than other forms of lighting.

2. It has a much higher amenity value.

3. Since all fluorescent installations will derive equal benefit from expected increases in lamp efficiency there is no advantage in deferring projects. On the contrary it is clearly in the national interest that capital shall be invested in an asset of increasing value.

4. The overall cost of fluorescent street lighting is certainly no higher than that for comparable discharge lighting, and the prospect is that the running cost of existing installations will decrease because of eventual reduction or elimination of the purchase tax on lamps.

5. Large scale planning of street lighting modernization requires some assurance that the lighting equipment on which it is based will not become obsolete during the period envisaged for the plan. Fluorescent lighting may well expedite the obsolescence of competitive methods but is unlikely to be superseded itself in the foreseeable future.

6. The present cost of fluorescent lanterns, which is the main obstacle to their greater use, includes relatively high overhead and development charges. There is clearly a very good prospect of lanterns becoming cheaper as demand increases. This prospect cannot be ignored by lighting authorities in long-term planning.

Street lighting has never been easy to classify either as a public service, a branch of engineering or a commercial field. It occupies a special place of its own in all these spheres and any attempt to approach its problems by analogy with other services, techniques or commercial products is doomed to failure.

Capital and Running Costs per Point for Comparable Light Sources

	Fluorescent 2/80 W	Mercury 250 W	Sodium 140 W
Average lumens (lamps only)	7,200	8,000	9,000
Typical capital cost of column, lantern and control equipment	£70	£50	£50
Amortization (on P.W.B. loan terms). Allow 8% per annum	£5 12 0	£4 0 0	£4 0 0
Electricity at 1·2d/kWh (National average)	£4 0 0 (£2 18 0)	£5 8 0	£3 6 0
Lamp replacements	£1 8 0 (18/–)	£2 14 0	£4 5 0
Annual cost (excluding items referred to in notes)	£11 0 0 (£9 8 0)	£12 2 0	£11 11 0

NOTES.—1. Figures quoted are for all-night all-year burning except those in parentheses in which allowance is made for one lamp only remaining alight after midnight. 2. No provision is made for periodical maintenance, or for capital costs of service connections, time switches or reinstatement of roadways as these are assumed to be common for all types. 3. Current consumption and lamp replacement costs are based on actual records of existing installations.

Sound Partnership

Co-operation between the supply industry, manufacturers and lighting authorities has grown into a partnership which is marked by the high standard of responsibility shown on the commercial side and by the confidence with which lighting authorities seek their advice. This situation imposes a heavy responsibility on the supply industry and on the manufacturers for guiding the development of street lighting in the right direction. Decisions taken now will affect the safety and the convenience of people twenty years hence and it is clearly of the greatest importance that nothing should stand in the way of the best street lighting.

It is all the more unfortunate, therefore, that the present restriction of capital for investment in street lighting has created a situation in which the first cost of lighting equipment has tended to overshadow other considerations and to render the task of lighting advisers more difficult. It is to be hoped that the investment brake will eventually be removed but while it is with us we can at least counter its worst effects by seeking the best in street lighting and by recommending it. The lighting industry in Britain has developed fluorescent street lighting technique and equipment to a degree unequalled by the rest of the world and it should exert its full influence towards the realization of the possibilities it has created. But the advisers must be in agreement among themselves first.

NEW BOOKS

D.C. Generators and Motors. By J. E. Macfarlane. Pp. 99; figs. 38; index. Sir Isaac Pitman & Sons, Ltd., Parker Street, Kingsway, London, W.C.2. Price 8s 6d.

There has long been a need for a simple and concisely written book such as this providing an introduction to d.c. machines for those who are not suitably equipped to study the more advanced text-books. It should be of particular value to students studying for the Ordinary National Certificates and to all who are engaged in electrical installation work.

Making use of the simplest algebra and elementary arithmetic, the book deals with the essential parts of the d.c. generator and motor, the characteristic curves of dynamos, the resistance of d.c. machines, installation and testing, parallel operation, speed control and maintenance. There are also a number of problems for solution. This book certainly gives the reader his money's worth and should provide him with a firm foundation for continued study.—R.P.

Introduction to Valves. By R. W. Hallows and H. K. Milward. Pp. 152; figs. 107; index. Published for the *Wireless World* by Iliffe & Sons, Ltd., Dorset House, Stamford Street, London, S.E.1. Price 8s 6d.

This book describes the principles of operation of the radio valve and its uses in circuits of various types. Following an explanation of the fundamental thermionic valve, it deals with diodes as rectifiers and detectors, triodes and their various applications, tetrodes and pentodes, multiple-grid valves for frequency-changing, power-output valves, and valves for v.h.f. and e.h.f. operation. Other chapters discuss special-purpose types and the construction of modern miniature and sub-miniature valves.

The system of letter symbols for valves introduced by the British Standards Institution in 1947 is used throughout, and a full explanation of this valuable system is given. Although this book does not attempt to provide more than a general introduction to this large and complex subject, the reader is given an excellent grounding in a clear and concise form, and the technical level is sufficiently advanced to make the work useful to the more knowledgeable radio student as well as to the novice.

Small Motors and Transformers: Design and Construction. Edited by E. Molloy. Pp. 176; figs. 120; index. George Newnes, Ltd., Tower House, Southampton Street, London, W.C.2. Price 15s.

This well-illustrated practical handbook is an enlarged edition of "Practical Design of Small Motors and Transformers." It will be very useful to those amateurs (and even technicians) who have not previously constructed fractional horse power motors or small transformers.

The first chapters deal with the d.c. generator and motor, giving full details of size, etc. The method of calculating the number of conductors on rotors and stators is explained, with magnetization tables for popular laminations.

Other chapters include information on rewinding armatures, various small a.c. motors, full constructional details of a $\frac{1}{16}$ h.p. universal motor and a $\frac{1}{8}$ h.p. cage rotor induction motor. Finally, there are chapters on the design of small transformers (for bell, power pack, and accumulator charging circuits).

This book is unusual in its thoroughness, and almost every "snag" is appreciated. The illustrations give methods of holding tools, etc., and there are tables of carbon brush sizes, standard wire gauge current capacity, copper resistance, and weight.

Two useful features deal with simple balancing (on knife edges), and recognition and cure of faults.—E.H.S.

Books Received

Definitions and Formulæ for Students: Telegraphy and Telephony. By E. Mallett. Revised by W. T. Palmer. Second edition. Pp. 41; figs. Sir Isaac Pitman & Sons, Ltd., Parker Street, Kingsway, London, W.C.2. Price 1s 6d.

Principles of Alternating Current Machinery. By R. R. Lawrence and H. E. Richards. Pp. 623; figs. 346; index. McGraw-Hill Publishing Co., Ltd., 95, Farringdon Street, London, E.C.4. Price 60s in United Kingdom.

New Kent Fire Station

Installation at Chatham Establishment

ON Saturday last the first new major fire station to be built since the war for the Kent Fire Brigade was opened by Sir David Maxwell Fyfe, Home Secretary. This, the Medway Fire Station, serves the towns of Strood, Rochester, Chatham and Gillingham, and within its area are such installations as dockyards and Naval establishments, and an oil refinery.

The station buildings house the divisional administrative staff and at the rear is a covered vehicle washing space, a large drill yard, a drill tower and workshops. Senior officers' houses are situated at the boundary of the drill yard and the site allows for the erection of an ambulance station and garage.

A three-phase supply is obtained from an adjacent substation on the South Eastern Electricity Board's network; the service cable is connected directly to a 150 A English Electric combination fuse-switch unit on the main switchboard, and distribution is on orthodox lines. Sub-main cables to the scattered buildings are carried through the heating ducts and both heat resisting cables (B.I.C.C.) and Pyrotenax cables have been used for these services.

Fluorescent lighting has been adopted for the appliance room and the watch room. The appliance room roof is of barrel vault construction and in order to maintain the clean and pleasing sweep of the ceiling G.E.C. twin batten type instant start fittings have been used; these have been so arranged as to provide ample illumination on all sides of the vehicles. The watch room contains the main control desk and as this room can be used for office work, both direct and indirect fluorescent lighting is employed so that a high intensity of lighting can be used during normal working hours, and a relatively low intensity during the "quiet hours," using indirect lighting only. The covered vehicle wash is immediately behind the appliance bay and ample lighting has been provided to facilitate the washing of vehicles at any time and the drill yard can be floodlit so that training can be carried on during the hours of darkness if necessary.

Owing to the large masses of concrete used in the construction of the appliance room provision for the different coefficients of expansion of concrete and brickwork had to be made when installing the conduit runs, and these runs between the various parts of the building were off-set by at least 24in at the building expansion joints.

Bells, clocks, emergency lighting and signalling installations are supplied from a

100 Ah (10-hr rate) battery, and in the event of a complete failure of the main supply the station can remain fully operational. A 60 V battery was considered to be the most economical having regard to the lengths of cable runs, volt drop, etc., and the master clock, bells and signalling lamps and emergency lights are all operated at this voltage. Emergency points are so disposed as to give some degree of lighting in all important sections of the building and these also act as " turn-out " lights in the event of a fire call. They are installed on stairways, corridors, etc., and are automatically switched on through a central control panel in the control room for a turn-out.

The emergency lights are normally fed from the mains through a step-down transformer, and should this supply fail an automatic change-over contactor in the battery control cubicle immediately switches over the circuits to the battery. This contactor is biased to the mains supply so that the load is again transferred automatically to the mains on resumption of the supply.

The battery consists of 31 Tudor sealed cells, type SM 25/9, and under normal supply conditions is on trickle charge at 100 mA, but after a discharge under emergency conditions the apparatus provides means for quick rate re-charging at 7 A. Operation of the quick charge switch on the battery cubicle automatically connects the clocks and other circuits normally fed from the battery to 25 cells to prevent over-voltage on these circuits.

The main control panel, with a special " Londex " relay unit, is of a standard type designed by the Kent County Buildings Department engineers in conjunction with the County Fire Officer and it can readily be adapted to the requirements of various district stations; in the last three years a number of the older fire stations in Kent have been fitted and others will shortly be equipped with these control panels and relay units.

Alarm System

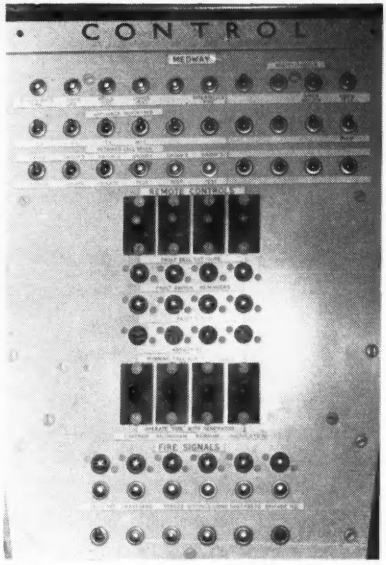
The special relay unit controls the alarm bells and the turn-out lights in the station. Depression of a " Bells/Lights " push on the panel will ring the bells and switch on the turn-out lights. A timing circuit in the relay unit automatically stops the bells after 15 seconds and the turn-out lights may be extinguished at the operators' convenience after the appliances have been despatched to the fire.

It has been found that this unit saves valuable seconds in turn-out time, and the alarm sequence can be initiated by callers from a prominently situated " Fire " push at the front door so that firemen are at their appliances as soon as the verbal message can be given.

Retained, or part-time, firemen attached to the station may be summoned to a fire call by means of bells installed in their houses and by siren, and operation of a single push on the control panel will ring these bells and switch on the siren. Group switches and test pushes for the bells form part of this section of the panel. Siren isolating and test switches are included in the siren contactor circuit.

Retained fire stations in the area of the district station, which are normally unattended but manned by part-time firemen, are controlled from the Medway station.

Watch room control console



Central control panel

Operation of the appropriate key will ring the house bells and operate the siren or sirens for the particular areas. Provision is made on the control panel for the transmission of fire signals to adjoining district stations and to the Fire Brigade headquarters at Maidstone.

Operation of house call bells, control of remote sirens and signalling and intercommunication between stations is carried out over the G.P.O. system and the Post Office has co-operated with the county engineers and arranged for their operating keys and signalling lamps associated with control circuits to be incorporated in the control panel. It has thus been possible to mount all the auxiliary gear in an adjacent relay room in a very compact and pleasing control room layout. A standard G.P.O. private branch exchange is incorporated in the control console.

Appliance indicator lights are fitted inside and outside each appliance bay. These lights indicate the appliances to be manned—this being pre-determined by the nature of the incident reported to the operator.

A mobilizing map to the left of the control panel is internally illuminated and has been so arranged that the major place names and fire stations appear as brightly illuminated words against a background of lesser intensity.

To the left of the console is the amplifier for a " Tannoy " address system. Speakers are fitted at strategic points throughout the building and in the drill yard, and microphones are fitted on the console and in the drill yard. The microphone in the latter position is fitted in a weatherproof box and controls a re-entrant loudspeaker so that instructions can be given to firemen carrying out drills in the yard or on the drill tower. Groups of speakers and microphone circuits may be selected at will through a small control panel in the desk immediately above the amplifier, and arrangements are made so that the watch room staff have overriding control of the microphone circuits.

Radio Communication

A v.h.f. receiver is provided to monitor communications between the Fire Brigade H.Q. and the Fire Service radio vehicles, which operate on, and share the use of, the Kent police authority v.h.f. system.

A Gent impulse clock and slaves have been installed.

There is a vehicle battery charger in the main switch room and l.v. circuits are carried to charging sockets on the wall of the appliance room—one immediately behind each appliance so that the batteries may be charged without removing them from the vehicles.

The hot water and heating systems are oil fired, electrically ignited and controlled. Temperatures are controlled by thermostats and motorized valves and the usual electric boiler room auxiliaries are provided.

The electrical scheme was designed by the engineering section of Kent County Council, Buildings Department, county architect, Mr. S. H. Loweth, F.R.I.B.A., F.S.A. ; engineer, Mr. H. H. Westbrook, B.Sc.(Eng.), A.M.I.C.E., M.I.H.V.E. ; electrical engineer, Mr. E. J. Walters, A.M.I.E.E., and senior electrical engineering assistant, Mr. F. W. Wilson, A.M.I.E.E. The main electrical contractors were Grierson, Ltd., who also manufactured the control panel.

Acknowledgments are due to the County Fire Officer, Mr. J. H. Fordham, for permission to publish this article and for the use of photographs.

Transformer Development

Foster's Fifty Years of Specialized Experience

THIS year Foster Transformers, Ltd., celebrates the fiftieth anniversary of the foundation of its organization. During almost the whole period of its existence this company has been concerned with the development of transformers and to-day it claims that its range of equipment is one of the widest and most varied in the world, production capacity having progressively increased over the half-century to meet the growing demand.

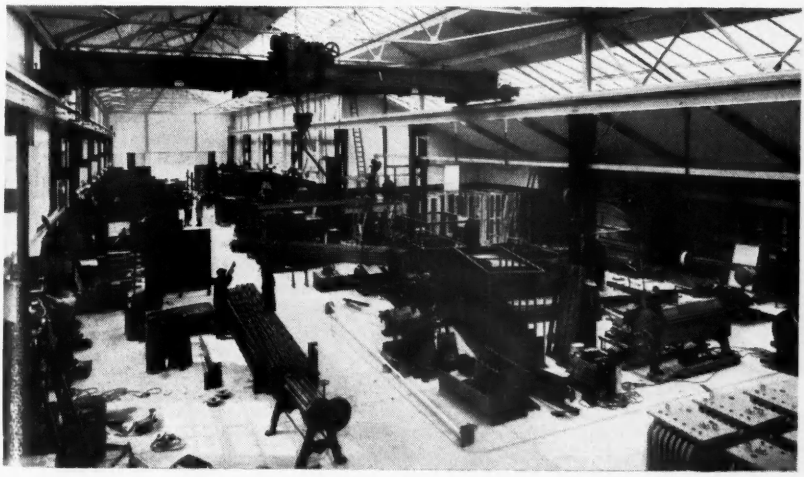
The history of the company started in 1903 with the establishment of a small workshop in Worple Road, Wimbledon, for the manufacture of the Foster hot wire arc lamp. This new design in arc lamps, then the only means of lighting large areas by single units, brought prosperity to the young company. In 1908 the "Brockie Pell" another well known arc lamp company was acquired, and soon after metal filament vacuum lamps with auto transformers were developed. To deal with the expansion of business in this field, the company's works were moved in 1910 to their present site at South Wimbledon.

The development, design and manufacture of transformers then became a major interest of the Foster company. During the first year in the new works transformers of 100 kVA capacity were made, and each year saw new developments as the company gained experience. In this way the company's claim to be industrial transformer specialists has been built up over the years.

In 1937 the company became a wholly owned subsidiary of Lancashire Dynamo & Crypto, Ltd., subsequently becoming an associate in the Lancashire Dynamo group of companies.

To-day, in addition to current and power transformers up to 3,000 kVA, the company's range of products includes all types of test equipment and voltage regulators based on the use of transformers. Another notable contribution to the needs of industry was the range of Foster "H.I." switchgear which, for many years, was manufactured at Wimbledon. In the

Main tank assembly shop, No. 2 factory, Leatherhead



Small transformers and arc welding equipment in the course of manufacture

interests of specialization this undertaking was transferred in 1951 to a new associate company, Lancashire Dynamo Switchgear, Ltd., so that now the Foster organization, under the guidance of its founder and chairman, Mr. M. V. Ely, C.B.E., and with its unique experience, is devoted wholly to meeting the needs of industry in the transformation, regulation and control of power supply.

The Wimbledon works now occupy an area of 5½ acres, and employ 900 men and women. Throughout the years there has been continuous growth. The core shop was reorganized in 1951 and doubled in size, special-purpose guillotines, presses and tooling for precision production ensuring that every core meets the exacting standard to which it was designed.

In the well equipped assembly shops special provision is made for line production as well as for a wide variety of special gear. Particular attention has been paid to the use of handling plant including conveyors, travelling cranes and mechanical trucks. The coil winding shops contain many highly efficient machines developed by the company's own engineers, including ring type toroidal winding machines for circular current transformer coils. To assist in securing the highest possible insulation standards the latest types of vacuum impregnation autoclaves are in use.

From the earliest days electric arc welding has been a Foster speciality and steel fabrication has been employed wherever possible. Early types of cast iron tank, plain or ribbed, for oil immersed transformers, very quickly gave place to welded steel tanks in their various forms. All steel requirements are fabricated from the raw material stage, and, to keep pace with the need for increased output, a new unit, the No. 2 factory, was recently established at Leatherhead. Designed and equipped on the most advanced lines, the new factory has quickly proved its worth not only for what it manufactures but also for freeing space at the main factory much needed for the extension of the machine shop and assembly lines, with the installation of new drying ovens.

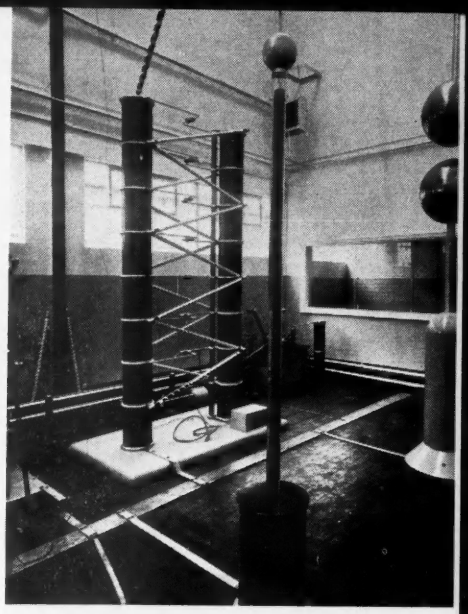
It speaks well for the happy working conditions in the company that all the personnel involved were willing to be transferred from Wimbledon to the new factory. Incidentally a remarkably high proportion of the workpeople have been with the company for over twenty-five years. Maintenance of the supply of skilled craftsmen required has been greatly assisted by a flourishing apprenticeship and training scheme.

Rigorous testing is carried out at every stage of manufacture from the receipt of raw materials to the final assembly of the finished equipment. For testing equipment destined for every country in the world there is a variety of machinery from small high frequency generators to large

synchronous motor-alternator sets. Mobile trucks facilitate testing operations and at the same time reduce the amount of equipment required. Wide use is made in the test department of the company's own products including distribution, current loading and instrument transformers, voltage regulators and control units.

Beginning as a test section for special equipment, the Foster research unit initiated some years ago now occupies an entirely new building, fully equipped with the latest apparatus. Laboratory methods of control are applied to all manufacturing operations and to the examination of new materials, methods and processes. The trend towards smaller and more efficient transformers requires materials capable of meeting specifications which daily become more exacting. Equipment for testing under extreme conditions has also been installed whereby an adequate factor of safety can be assured. As the latest extension of the company's research facilities a high voltage laboratory has recently been built housing a 500 kV Marx impulse generator and a 300 kV transformer complete with control, measuring and recording apparatus.

Product development is an important aspect of Foster enterprise and an experi-



A view of the new impulse testing plant

Large transformer assembly

Materials testing laboratory

mental shop is used widely to produce, quickly, prototypes to customers' specific requirements. User problems are of particular interest to the team of specialists which has been built up to study each group of products.

A very high proportion of the company's output is directed to the export market. Nowadays Canada is one of the best overseas customers and an interesting contract nearing completion for use in a large paper mill is a 2,500 kVA 2·4 kV 12-phase rectifier transformer built in two separate units, one containing the main and auxiliary transformers and the other the interphase transformers and flanged chokes.

Production Control

IN 1951 a team of six specialists visited the United States to study American methods of directing manufacture from the final design to dispatch of the product. Its report has just been published by the Productivity Council, 21, Tothill Street, London, S.W.1 (price 5s). The team included Messrs. J. A. Clark (Plessey Co., Ltd.), E. H. Goodchild (British Thomson-Houston Co.), T. W. Price (E.M.I. Factories, Ltd.), and G. P. Truby (Automatic Telephone & Electric Co.). Twenty establishments were visited and examples of a number of systems inspected are described in the report.

Among the conclusions reached by the team are the following:—American managements arrange their production after assessment of the markets for products; it appears to be the aim of all firms to reduce the number of types of products to the minimum; two- or three-shift working contributes to lower costs of products; the "comparative youthfulness" of executive officers was noted; production planning and control are given equal status to design, sales and accounting; individual approaches are made to fundamental problems; each stage of manufacture and material procurement is planned in meticulous detail; there is a ready acceptance by management, employees and trade unions of improvements in systems and methods; and there is a "fierce desire" to honour delivery promises.

It is recommended that all British firms should examine their present systems of production planning and control in the light of the report. If they are not at present operating effective systems on the lines indicated these should be established without delay. Even small firms can institute efficient and simple systems to meet their needs and increase productivity.

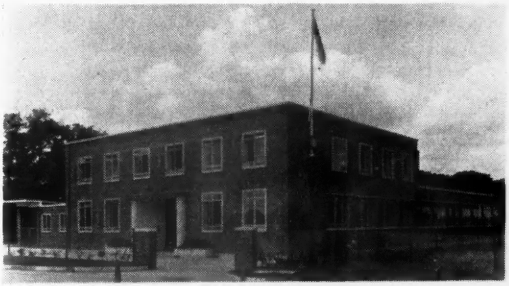
Railway Developments

IN his presidential address to the Institute of Transport on 5th October, Mr. John Elliot (chairman of the former Railway Executive and now chairman of London Transport Executive) gave an "Account of Stewardship" in which he described developments in British Railways which were now making savings of £16 million annually since their unification on 1st January, 1948. British railways were unique in the density of traffic they dealt with, and freight and passenger mileages were now much in excess of pre-war figures.

Diesel-electric locomotives had justified their place in shunting yards and, with gas turbines, were on trial for main line working, but in this small country of short runs exceptional operating advantages were necessary to offset the higher first cost. Conversion from 25 to 50 c/s (costing £12 million) of part of the former Southern Railway, the largest suburban electrified system in the world, would enable ten-coach instead of eight-coach trains to be run in 1954. There were now 6,700 colour light signals compared with 4,300 at the end of 1947. Further electrification schemes would be proceeded with as soon as capital restrictions were removed.

Appliance Testing

New E.D.A. Establishment at Leatherhead



IT was mentioned in the last annual report of the British Electrical Development Association that operations had been commenced at the new Testing House which had been erected at Leatherhead, Surrey. On Monday last the new establishment was formally opened by Sir Henry Self, president of E.D.A., when an opportunity was given to a large number of visitors to inspect the arrangements for testing appliances.

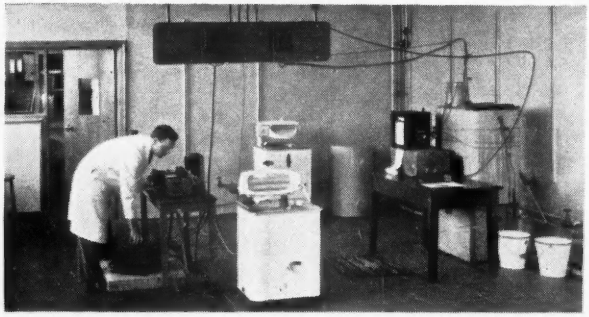
The Testing House is an unadorned but handsome brick building of two floors. The ground floor is L-shaped; one arm (or wing) comprises the loading bay, stores and handling room, transformer and switch rooms. In the other wing, leading straight down from the entrance hall, are the various laboratories, battery room, workshop, offices, etc. On the first floor are offices and photographic and X-ray rooms. Provision has been made in the siting and construction of the building for both lateral and upward extension.

Ample natural lighting is provided in the laboratories. In the portable appliance laboratory benches are arranged by the windows on two adjacent sides and there are also commodious central tables. Here we saw under test vacuum cleaners, fires, irons, hotplates and a variety of other equipment. The mechanical and electrical methods adopted are ingenious, but for the most part quite simple. For instance a number of types of connectors were seen plugged into a sort of hotplate to ascertain their behaviour under prolonged high temperatures. A simple inclined board is used for testing the stability of irons when set up on their backrests. Vacuum cleaner suction is proved by a U-tube water gauge.

Power supplies for the benches are taken through floor ducts to open troughs under the centre of each bench, and water, gas and air supplies are also brought in through ducts.

The large apparatus laboratory has adequate clear floor space with special arrangements for bolting down appliances which have to be secured during

Portable apparatus laboratory; battery and exchange connection panels at end of room



One end of large apparatus laboratory. At the other end cooking tests are conducted

testing. Similarly there are adjustable racks for accommodating wall-fixing water heaters, etc.

In this apartment the power and other supplies are taken overhead to keep the floor clear. Part of the area in which water-heating appliances are tested has a metal-grating-covered open trough drain. Extract fans deal with steam and cooking odours (practical tests are made on cookers here).

Special attention is paid to the suppressors fitted to appliances. For this purpose there is a small screened radio interference room the electricity supply to which is passed through a filter unit.

For testing appliances under controlled temperature and humidity there is a chamber entered from the large appliances laboratory. Air is forced into a duct at the top of the chamber, passed through a plenum system and exhausted through ducts in the lower part of the apartment. This air comes from an air-conditioning plant situated in an adjacent room.

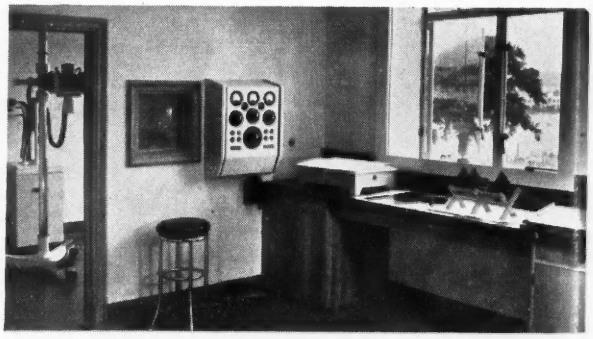
In the life test room appliances are run for long periods under normal conditions of use or on special time cycles. Some equipments, e.g., electric blankets and pads are subjected on special apparatus to rough usage such as is likely to be encountered in service.

Much of the special gear required in the laboratories is designed and constructed in the workshop in which also appliances may be dismantled for examination after test.

Thorough photographic records are produced of tested apparatus and for this purpose there is a well-equipped photographic department. Here there is also a 150 kV X-ray set by means of which the interior construction of apparatus and accessories can be studied without their being taken apart.

Most of the heating of the testing house is done by means of cables embedded in the floors. The cables consist of copper sheathed refractory insulated wires covering practically the whole of the floor area and spaced between 3 and 6in apart. The control system ensures that the total load never exceeds a third of the maximum and there is also an over-riding control which balances the heating load with that of the laboratories. At night, however, full load is available and advantage is taken of the heat-storage capacity of the floor concrete.

Throughout the building fluorescent lighting has been installed. In the main laboratories and photographic room twin-tube troughs with lattice louvres are used.



The photographic room with viewing window for the X-ray equipment seen in a separate apartment

An electric washing machine undergoing test at Leatherhead. The inspecting party comprises (left to right) Mr. R. Harvey, Dame Caroline Haslett, Mr. H. Nimmo, Sir Henry Self, Mr. E. R. Wilkinson and Mr. V. W. Dale

Elsewhere there are single tube fittings and in the corridors effectively simple " Perspex "-shaded lamps are installed.

A 415 V three-phase supply is taken from a S.E. Electricity Board outdoor substation accommodated in one corner of the building. This supply goes to the switchroom and is taken thence to the laboratory wing by four busbars enclosed in trunking along the corridor wall. This trunking also carries the gas, air and water mains. Control gear is installed at four convenient points.

D.c. for test purposes, clocks, signal system and emergency lighting, is provided by a 300 V, 150 Ah battery. An " exchange " panel enables any battery voltage, as selected from the battery panel, to be connected through plugs and flexible cables to any laboratory.

The architects for the building were Mr. L. H. Bucknell and Miss Ruth Ellis. The manager is Mr. R. Harvey, B.Sc., A.Inst.P.

Speaking at the opening ceremony Sir Henry Self (who was introduced by Dame Caroline Haslett, chairman of the E.D.A. Council) traced the origins of the Testing House which, he said, arose from the appearance of many inferior appliances after the war. In 1947 an E.D.A.–B.S.I. Advisory Committee on Electrical Appliances and Accessories was appointed to deal with the subject and a Testing House was set up in London by the E.D.A. Council. This establishment had not only dealt with appliances for the home market, largely on behalf of Electricity Boards, testing of apparatus for compliance with British or foreign standard specifications was also undertaken. Overseas buyers could rely upon the reports produced by the Testing House.

Mr. H. Nimmo, chairman of the Advisory Committee, spoke of his Committee's activities and aspirations. He said that half of the appliances sent for test came from manufacturers and importers. About 90 per cent of the equipment submitted had some defect or other which had to be rectified. It was essential that this country should have such an establishment; most other countries had testing houses.

E.A.W. Activities

OVER 250 representatives of the Electrical Association for Women from the Stafford, Blackburn, Middleton, Oldham, Nelson, Blackpool and Fylde, and Chorley Branches recently visited the Liverpool Works of the English Electric Co. The object of the visit was to give them an opportunity of seeing the various stages in the manufacture of the modern domestic appliance. In the Domestic Appliance Works the visitors were given the first showing in public of the company's new automatic cooker.

Mr. H. C. Timewell, manager of the Domestic Appliance Division, welcomed the visitors at tea, and later there were demonstrations of appliances.

From 27th to 30th October over 150 E.A.W. Branch officers and committee members from all over the country will meet at Bournemouth, and a similar conference for the Association's twelve Branches in Scotland is taking place at Pitlochry from 16th to 19th October. In each case they will discuss the duties of chairmen, secretaries, treasurers and magazine secretaries; they will consider how Branch programmes should be compiled to meet individual needs, and the requirements of the district in which a Branch is situated; they will learn the intricacies of committee procedure and the conduct of public meeting; and will see how the Association's programme of electrical education is related to the needs of to-day.

I.E.E. Sub-Centre Chairmen

FOLLOWING the publication in previous issues of the biographical notes of the chairmen of the specialized Sections and provincial Centres of the Institution of Electrical Engineers, we now give below brief notes of the chairmen of four of the Sub-Centres.

MR. W. E. B. NETTLETON (Sheffield) is engineer, No. 3 (Sheffield) Sub-Area, of the Yorkshire Electricity Board. He received his education at Barnsley Grammar School, and the Manchester College of Technology, and his training with the British Westinghouse Co. From 1921 to 1926 he was supervising engineer in the Erection Department of the Metropolitan-Vickers Electrical Co., Ltd., after which he joined the Salford Electricity Department as e.h.v. engineer. In 1938 he went to Sheffield, where he held various positions in the Electricity Department up to deputy distribution engineer. He was appointed chief assistant sub-area engineer in 1948. Mr. Nettleton served in the R.F.C. during the 1914–18 war.

MR. H. CHARNLEY (North Lancs) received his technical education at the Harris Technical College, Preston, and served an apprenticeship at the Dick Kerr works of the English Electric Co., Ltd. He was later engaged on electric railway projects in Spain, France, India, Argentina, Holland, and in this country. In 1947 he visited the United States to inspect and observe American diesel-electric locomotives. Mr. Charnley has given several lectures before societies mainly on electric traction and 3-phase motors. He is now in the Crompton Parkinson Traction Division.

MR. A. DRAPER, B.Sc. (Eng.), (Rugby), is head of the Electrical Engineering Department of the Rugby College of Technology and Arts. He was educated at Carlton Grammar School, Bradford, and Bradford Technical College and served an engineering apprenticeship with the English Electric Co., Ltd., Bradford, after which he was for two years assistant to the commercial engineer of the Bradford Corporation Electricity Department. He was appointed lecturer in electrical engineering at Rugby College of Technology and Arts in 1929, becoming head of the Services Training Department in 1940 and taking up his present position in 1946. Mr. Draper was a member of the first committee when the Rugby Sub-Centre was formed in 1946.

MR. H. V. HENNIKER (South East Scotland) is managing director of Henniker, Thewsey, Ltd., of Edinburgh and Manchester. His education was received at St. Lawrence College and Sheffield University, and his practical training in Sheffield and with the Newcastle-upon-Tyne Electric Supply Co., Ltd. He joined Bruce, Peebles & Co., Ltd., in 1914, becoming chief assistant of the Sales Estimating Department in 1918, and chief assistant in the Contract and Sales Department in the following year. He was at one time head of the Electrical Engineering Department of Leith Technical College and he has lectured and published many articles on industrial electrification. Mr. Henniker went into business on his own account in 1932 and in 1945 formed his present company. He is a past-chairman of the Lothians Branch of the Association of Mining Electrical and Mechanical Engineers and was hon. joint secretary of the I.E.E. Scottish Centre from 1926 to 1952.

Mr. W. E. B. Nettleton

Mr. H. Charnley

Mr. A. Draper

Mr. H. V. Henniker

PERSONAL and SOCIAL

News of Men and Women of the Industry

BELFAST City Council, at its meeting on 1st October, confirmed the appointment of **Mr. R. P. Watson,** B.A., B.A.I., M.I.E.E., as city electrical engineer. Just over a year ago, Mr. Watson was appointed acting city electrical engineer, and since then he has been responsible for much of the development of the city's electrical services. Mr. Watson has been in the service of the Corporation Electricity Department for nearly thirty years.

Mr. J. S. Beddows, A.M.I.E.E., has been appointed manager of the Stoke-on-Trent Branch of the General Electric Co., Ltd. He succeeds **Mr. H. E. Downing** who retires after thirty years' service with the company at the end of this month. Mr. Beddows joined the G.E.C. in 1935, and served in various departments of the company's Birmingham Branch before joining the Army in 1939. He was commissioned in the Corps of Royal Engineers in 1940, and saw service in India, Burma, Malaya and Java, achieving the rank of major. On his return to the G.E.C. he was for a period at the company's Coventry Works. Later he spent six months in various sales departments of the G.E.C. Birmingham Branch, and in 1947 was appointed a representative at the Stoke-on-Trent Branch.

Mr. J. S. Beddows

Mr. G. V. Harrap, manager of the Gravesend District, South Eastern Electricity Board, has been elected president of the Gravesend and District Engineering Society.

Mr. L. Rumley, sales director of Conveynacer Fork Trucks, Ltd., has left England for a visit to the company's Canadian Associate, Electro-Hydraulics (Canada), Ltd., of Toronto. He expects to return to this country towards the end of the month.

Mr. F. A. Austin, works manager, Hoover (Washing Machines), Ltd., Merthyr Tydfil, has been appointed chairman of the East Wales Productivity Committee which has recently been set up by the Industrial Association of Wales and Monmouthshire.

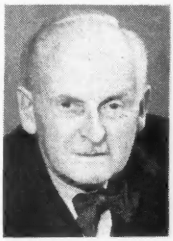
At the recent National Conference of the Purchasing Officers' Association, **Mr. H. H. C. Wood** was elected president for 1953-54. He is chief purchasing officer and stock controller of the Igranic Electric Co., Ltd., Bedford, with whom he is just completing twenty-five years' service. Mr. Wood was the founder-chairman of the Beds. and Herts. Branch of the Association. He was awarded the Croix de Guerre in 1916.

Mr. H. H. C. Wood

We are very glad to report that **Mr. Victor Dale,** general manager and secretary of the British Electrical Development Association, has resumed his activities after a prolonged illness.

Mr. K. C. Thompson, senior section head in the Chief Accountant's Department of the North Western Electricity Board since nationalization, has been appointed chief accountant to the Board. He will take up his new duties on 30th November next. Mr. Thompson, who is thirty-nine, will succeed **Mr. A. Heaton,** the Board's chief accountant since its formation, who is retiring. For ten years before nationalization, Mr. Heaton had

Mr. A. Heaton



Mr. K. C. Thompson

been chief accountant to the Manchester Corporation Electricity Department, following ten years as deputy chief accountant. Altogether he gave thirty-three years' continuous service to the Manchester Electricity Department, broken only by absence in the Army during the 1914-18 war.

Before joining the Board, Mr. Thompson was deputy borough treasurer at Bury. Educated at King Edward's School, Birmingham, he served in the treasurers' departments at Birmingham, Wolverhampton and Stockport before going to Bury. He is an associate of the Institute of Municipal Treasurers and Accountants, an incorporated accountant and a chartered secretary.

Mr. J. M. Dodds, LL.B., secretary of the Yorkshire Electricity Board, is resigning because of ill-health. At a meeting of the Board on 1st October, Mr. Dodds' resignation was accepted, to take effect from 31st December next. Mr. Dodds, who has been secretary of the Board since nationalization, was educated at Leeds University, and was Town Clerk of Harrogate from 1935 to 1948.

From 1st October **Mr. R. C. Robinson,** late of the Supplies Division, Crompton Parkinson, Ltd., has been appointed sales manager of Morphy-Richards, Ltd. He will be responsible for all matters appertaining to home sales.

The British Welding Research Association announces that **Dr. A. A. Wells** has been appointed chief research engineer and head of the engineering research station at Abington, near Cambridge, and that **Mr. R. P. Newman** will be chief administrative officer of the station.

Dr. A. A. Wells

Dr. Wells was educated at the City of London School and University College, Nottingham, where he graduated in 1943. For a short time he served an apprenticeship with Thomas de la Rue & Co., Ltd., before entering the university, and after graduation he was appointed to the Naval Construction Research Establishment at Rosyth as an experimental officer in the photo-elasticity and model stress analysis laboratory. In 1946 Dr. Wells was a research engineer with Babcock & Wilcox, Ltd., at Renfrew before joining the Engineering Department of the University of Cambridge. There, he conducted research into soil mechanics, with reference to tillage implements, and in 1950 took his Ph.D. in this subject. In the same year he was appointed to the B.W.R.A. as a scientific officer in the engineering research station. In this position his interests have broadened to include stress analysis of welded pipes and pressure vessels, the fundamentals of resistance welding, oxygen cutting and related thermal problems, and a basic study of the mechanics of brittle fracture of steel.

Mr. R. P. Samels has been appointed manager of the Bedford branch of W. T. Henley's Telegraph Works Co., Ltd., as from 1st October, in succession to **Mr. D. C. Mason,** B.Sc., A.M.I.E.E., who has taken up another appointment with the company. Mr. Samels commenced with Henley's at the head office in 1940, and after experience in the Engineering Sales Department he was appointed a representative at the Bedford branch of the company in 1948.

Mr. R. P. Samels

With the impending retirement during 1954 of **Mr. W. A. Crewe,** general manager, after more than thirty years' service, the Delco-Remy-Hyatt Division of General Motors, Ltd., announces the following managerial changes, effective from 1st October:—**Mr. C. H. Charles,** general sales manager, is appointed executive assistant to the general manager; **Mr. W. B. Jones,** power and industrial sales manager, becomes general sales manager; and **Mr. S. Jackson,** parts and accessories sales manager, becomes assistant general sales manager. Coinciding with these changes, **Mr. L. Bell** is appointed supply manager, succeeding **Mr. G. E. Elen** who is taking up new duties with the Frigidaire division.

The South Wales Electricity Board announces that **Mr. A. L. Welti,** at present commercial officer, Dumfries Sub-Area, South West Scotland Electricity Board, has been appointed district commercial manager, District 347 (Cardiff East), in succession to **Mr. C. V. Ball,** who has been appointed commercial officer, Central Sub-Area, Cardiff.

Mr. T. E. Reece, B.Sc., A.M.I.E.E., formerly senior assistant engineer, mains planning and development, in the Chief Engineer's Department of the Board, has been appointed senior assistant, industrial supply, in the Chief Commercial Officer's Department at head office.

Mr. Ian McLeod, Mem.A.S.M.E., A.M.I.Prod.E., has joined the process

engineering division of Sharples Centrifuges, Ltd. Mr. McLeod was formerly chief engineer with the Premier Mill Corporation, Geneva, New York, U.S.A.

Mr. Miles Beevor, managing director of the Brush Electrical Engineering Co., Ltd., left by air on 29th September for Canada, where he will visit the subsidiary companies of the Brush group. Mr. Beevor is accompanied by **Mr. J. W. C. Milligan,** general manager of the Loughborough works and a local director.

Mr. N. T. Anthony has been appointed sales representative for **Siemens Electric Lamps & Supplies, Ltd.,** Birmingham. He was previously lamp sales representative in the Nottingham and Lincolnshire area for the Metropolitan-Vickers Electrical Co., Ltd.

The first luncheon of the **Batti-Wallahs' Society** after the summer "recess" was made notable by the presence of Mr. Trevor Bailey, the England and Essex cricketer, whose entertaining talk on his encounters with the Australians, both in this country and in Australia, gave no indication that he was "batting on a sticky wicket." In his only reference to things electrical he showed how necessary it was, in these days of television, for a cricketer to conduct himself with decorum when on the cricket field.

Sir Thomas White, High Commissioner for Australia, was among many distinguished guests from the Commonwealth and the United States entertained by the **Engineering Industries Association** at luncheon at the Savoy Hotel, London, on 23rd September. Mr. J. P. Coleman, managing director of Gresham Transformers, Ltd., presided.

Sir Thomas White (left) and Mr. J. P. Coleman at the luncheon of the Engineering Industries Association

The Council of the Illuminating Engineering Society has announced the following awards in connection with papers presented to the Society during the past year. The Leon Gaster Memorial Premium has been awarded to **Mr. W. D. Chesterman** and **Mr. J. B. Collins** for their paper entitled "Problems of Underwater Illumination," which they presented at the I.E.S. Summer Meeting last year. Mr. Chesterman is with the Royal Naval Scientific Service and Mr. Collins is at the Building Research Station. The I.E.S. Silver Jubilee Commemoration Award has been gained by **Mr. J. R. Wakefield** of Nottingham University for a paper entitled "An Investigation of Glare in Mine Lighting." In view of the number and standard of entries submitted this year the Council has granted a second award to **Miss P. M. Excell,** of the Research Laboratories of the British Thomson-Houston Co., Ltd., for a paper entitled "Illuminating Calculations for Installations Using Long Linear Light Sources."

A dance and cabaret is being held by the London Group of the **Royal Engineers' Association** on 31st October at the Newington Public Hall, Walworth, S.E.17. Tickets (4s each) can be obtained from Mr. J. S. Pearson, hon. secretary, Room 31, The Horse Guards, Whitehall, S.W.1.

OBITUARY

Mr. L. E. Donovan.—The death occurred on 23rd September of Mr. L. E. Donovan, who for the past twenty-nine years had been manager of the Dublin Branch of Siemens Electric Lamps & Supplies, Ltd. Joining the company (then known as Siemens Brothers Dynamo Works) in 1919, he was originally a salesman for cables and telephones operating from the Cardiff Branch. In 1924 he was transferred to the lamp company, since which date he had been in charge of the Dublin office. Mr. Donovan was fifty-six.

Mr. H. L. Mills, former city electrical engineer of Stoke-on-Trent, has died at Cheltenham at the age of seventy-seven. Mr. Mills went to Stoke-on-Trent in 1920 as mains superintendent (southern area), was appointed deputy city electrical engineer in 1934 and became city electrical engineer in 1940. He retired in 1944.

Mr. H. C. Hazel.—The death occurred recently of Mr. Henry Curwen Hazel, M.I.E.E., who was for many years chairman of the Liverpool Branch of the Electrical Contractors' Association and was president of the E.C.A. in 1930-31. He resigned from the Association in 1933 to become the first inspector to the National Register of Electrical Installation Contractors, a position which he held for some years.

Mr. R. Henderson, an engineer in the Traction Department at Kirkby of British

Insulated Callender's Construction Co., Ltd., died on 27th September. Mr. Henderson joined the Contracts Department of the former British Insulated Cables, Ltd., in 1920, and was subsequently associated with many overhead line contracts in this country and abroad. In 1928 he was engaged on transmission line erection for the Perak hydro-electric scheme in Malaya, and in 1935 he supervised the railway electrification work being undertaken for the Central Railways of Brazil.

Mr. C. H. Panting.—The death has occurred, in hospital at Worcester, of Mr. Charles Henry Panting, at the age of sixty-two. Mr. Panting was sales manager for British Insulated Callender's Cables, Ltd., at Worcester, and had been with the company for over forty years.

Mr. P. Durston, manager of the South London Branch of Hoover, Ltd., died on 16th September at the age of fifty-six. Mr. Durston joined the company in 1932.

WILLS

Alderman J. Toole, late chief designer of Switchgear & Equipment, Ltd., who died on 16th June last, intestate, left £1,412 gross (£1,349 net).

Mr. S. G. Rattee, A.M.I.E.E., editor of the *Electrical Journal*, who died on 27th June last, left £3,517 gross (£3,343 net).

Mechanical Handling Film

WITH the coming season programmes of the institutions and official bodies, and the advent of the Fourth Mechanical Handling Exhibition to be held next year, considerable interest is being shown in the film "Mechanical Handling on Show." This documentary film, in colour with sound commentary, relates to some of the main exhibits at the Mechanical Handling Exhibition which is organized every two years by *Mechanical Handling* (one of the Associated Iliffe Press publications). In addition to forming a pictorial record of the Exhibition, it also provides an excellent insight to the main types of British equipment available for the handling of goods and materials, and the commentary explains their operation and applications to industry.

The film has already been shown with much success in many parts of the country, as well as abroad, and is particularly suitable for showing to professional and technical organizations, trade associations, engineering training colleges, chambers of commerce, etc., and industrial concerns. The film is available on loan, free of charge, upon application to *Mechanical Handling*, Dorset House, Stamford Street, S.E.1.

A Chance for the Industry

(From Sir John Dalton)

THE generosity of our great electrical industries towards their and our own Benevolent Association is such that, at a recent modest dinner of electrical men, the chairman, *as an afterthought*, said: "Let's have a penny collection for the E.I.B.A." That "penny" collection raised £35 in about ten minutes. The point about this is that the chairman's remarks came out of the blue and everybody responded. They didn't require any explanation about the E.I.B.A.; they just wanted reminding.

Those of us at the E.I.B.A. have been exercised as to the best way in which the undoubted generosity of our colleagues can be "reminded." I find that of our vast population of 225,000 staff members engaged in the electrical industries, under 9,000 are members or associate members of the E.I.B.A. Thus, an assured income (what we want) can arise from a greatly increased membership. Full membership is obtained for a minimum of £1 a year, and with it the right to have a say in the running of this excellent fund, which is in the forefront of the modern approach to personal problems. Associate membership costs as little as 5s a year.

I can remind all my colleagues and friends in the electrical industries that the demands of our Benevolent Fund have ncreased by 100 per cent over the last five years. Therefore, I ask earnestly that as many as possible engaged in our industries will become members, or, failing this, associate members, and will give to the E.I.B.A., and all those less fortunate colleagues of ours dependent upon it, their increasing generous support.

32, *Old Burlington Street*, *London, W.1.*

JOHN DALTON,
President,
Electrical Industries Benevolent Association.

Electrical Industries Ball

THE Electrical Industries Benevolent Association is holding its annual dinner and ball in the Great Room of Grosvenor House, London, on Friday, 13th November. Geraldo and his ballroom orchestra will be playing for the dancing, and tickets (2½ guineas each) can be obtained from the Association at 32, Old Burlington Street, London, W.1.

Earthing Practice

E.P.E.A. London Technical Group Lecture

At this session's opening meeting of the London Technical Group of the Electrical Power Engineers' Association, Mr. P. W. Cave* delivered a lecture on earthing under the three main headings of the earth electrode, its connection to the earth terminal and bonding. The requirements of an electrode and its connections, he said, were defined by Messrs. Fawssett, Grimmitt, Shotter and Taylor in their I.E.E. paper of October, 1940. These were, briefly: low enough resistance *at all times* to pass the current required to operate protective gear, adequate fault-current capacity, avoidance of steep voltage gradients on ground surface round electrode, resistance to soil and atmospheric corrosion and, in certain cases, low surge impedance to prevent lightning flashover from earthed metal to insulated conductors.

Choice of System

The choice between plates, strips, pipes and rods depended upon the resistivity of the soil at various depths in relation to economic considerations. Earthing by rods driven deep, preferably by mechanical hammers, was less dependent on seasonal conditions but was not feasible with rocky subsoil. Resistivity of soil in ohms/cu cm might vary from 1,000 million when dry to 200,000 with 2½ per cent moisture and to 5,000 with 30 per cent moisture and earth resistance of plates or pipes had varied by 14 to 1.

An empirical formula to determine the relationship between the life of an electrode in seconds and the current density on the surface in contact with a soil of known resistivity was developed to cover the design of an electrode to carry a given maximum current for a definite maximum time for operating protective gear. To avoid lowering resistivity through the drying effect of the current, the current carrying capacity must provide for the worst conditions.

Potential gradients of 10 V on the ground surface could kill cattle standing near an electrode at the incidence of a fault; this compared with 47 V, the lowest figure known to have been fatal to a man. Electrolytic corrosion occurred when dissimilar metals were in contact with damp soil, unless the junction, e.g., of cast iron and copper leads, were painted with moisture-resisting compound. Copper was attacked by some classes of coke, but otherwise was the safest metal for electrodes. Corrosive elements in soil were usually present for only a few feet down, below which free oxygen was absent. For surges due to lightning, rods (driven at least 8ft into the ground) were more efficacious than plates.

Where multiple electrodes proved necessary to obtain low resistance or high current carrying capacity, plates should never be less than 6ft apart; rods and pipes should be at least as far apart as their depths; strips should radiate from a point or be spaced in parallel lines several yards apart. Particulars were given of earthing systems, with reasons for their adoption, at an explosive hut (against lightning), a small substation, a power station and a large factory.

Bonding Requirements

The requirements of bonding, the function of which was to provide a low resistance path from metalwork so as to avoid dangerous potentials during faults or by induction under normal conditions, were discussed in detail with formulæ for determining the minimum size of bond for given short-circuit characteristics. For mechanical reasons a bond should never be smaller than 0·0045 sq in. The sheaths of lead-covered cables in close trefoil formation should be bonded together at least once in every 50ft by a sweated lead sheath connected to the main earth bus. At generating stations and substations, one common electrode for neutral and for carcase earthing was preferable to two separate electrodes, one reason being that under certain conditions fault current might have to traverse two electrodes in series.

*Consultant Engineer (Power Applications), British Insulated Callender's Cables, Ltd.

VIEWS on the NEWS

By REFLECTOR

"CHALLENGE to Britain," the Labour Party's policy statement, displayed a "go slow" attitude towards further nationalization, but the Confederation of Shipbuilding and Engineering Unions is insistent that large sections of the engineering industry should be acquired by the State. Accordingly a number of amendments were put up at the Party's annual conference last week seeking to change the official policy. They were all defeated, but a further amendment secured the remittal to the Party's executive of the question of a full inquiry into the heavy electrical industries with a view to nationalization. It is to be hoped that the executive is aware of the folly of anything of the sort and will reject the suggestion.

* * *

Electricity Boards have many troubles but I should have thought that one of them was not the over-anxiety of consumers to pay up—quite the contrary. Yet, according to the Belfast *Northern Whig*, the "South West Electricity Board" has had to lay in a stock of printed letters, of which it uses over a thousand a year, pointing out to consumers that they have paid their bills a second time. One theory, says the newspaper, is that a husband gets the original bill while his wife opens the reminder and both settle the account independently.

* * *

I find the newspaper headlines upon the B.E.A.'s annual reports an interesting study. This year there was by no means so much political bias, but it was occasionally apparent. Wherever possible the report was viewed from a local angle, e.g., papers circulating in mining areas stressed the point that future large power stations would be built near the East Fife, East Midlands and Yorkshire coalfields. The *Daily Express* generously headed its comment "Nice Work Sir!" (referring to the surplus made last year). The surplus was viewed in a different way by the *Daily Mail*—"Those Light Bills make 10s Profit" (i.e., per consumer). *Lloyd's List* concentrated on "Seaborne Coal for B.E.A.", while, providing the domestic touch, the *Daily Sketch* said: "Spend More to Save, Housewives are Told." The *Evening News* was sensational: "Citrine Reveals Atomic Power Plans." With not-unexpected rancour, the *Daily Worker's* editorial was entitled "Power Grab," and this was elaborated in the news section as "£36,000,000 Profit on Electricity, but £28,460,000 goes into Pockets of ex-Owners."

* * *

Mr. E. Metson, the first electrician at St. Paul's Cathedral, retired last week after 52 years' service. The *Daily Telegraph* reports him as saying that in all that time he could recall only one breakdown of the Cathedral lighting—and that was in 1903. One job he had to tackle during his career was the cutting of the chains by which suffragettes bound themselves to the chairs in the Cathedral. Trade union demarcation rules must have been slacker then.

* * *

A correspondent signing himself "Private Enterprise" writes to the *Daily Mail* to complain that he asked the local showroom of an Electricity Board to quote for a named car battery charger and still had not received it after a wait of two years. He therefore wrote to a "private enterprise" firm and received the quotation by return of post. He asks: "Does this not illustrate the main danger of nationalizing the means of supply and distribution?" I think it points to a lack of urgency on his part or infirmity of principle; otherwise he would have gone to "private enterprise" long ago.

Crompton's Seventy-Five Years

Records of the Company's Early Activities

SOME time in 1878 there came into being the first "parent" of the Crompton part of the present Crompton Parkinson organization, but, owing to the destruction of records, the specific date is not now known, although evidence suggests that at least in October, 1878, R. E. B. Crompton was established in business as an "electric light engineer." It was in that year that Crompton became interested in the application and manufacture of electric arc lighting equipment.

As a permanent record of the early work of Crompton and his associates, Crompton Parkinson, Ltd., established at Chelmsford a historic collection of machines, arc lamps, instruments, switches and other apparatus, together with designs, records and photographs. To mark the seventy-fifth birthday of the first "parent," a new collection has been opened this year.

The first business, in 1878, was known as Crompton & Fawkes, Crompton having formed a business with Mr. Fawkes of T. H. P. Dennis & Co., Ltd., for importing machinery from France, and it was in that year that the first football match was played under electric lighting at Sheffield. The first Crompton-Burgin dynamo was completed in December, 1880, and remained in service until 1926. By the beginning of 1881 Crompton's business was expanding rapidly and in the middle of that year he formed R. E. Crompton & Co., which took over the Chelmsford works of T. H. P. Dennis & Co., to manufacture electrical equipment. The first Crompton dynamo was born in 1882. By 1895 the Chelmsford works employed about 600 men and the Chelmsford power station was operated by Crompton's. In that year the works and power station were damaged by fire, and a new works was built on part of the site now occupied by the factories of Crompton Parkinson, Ltd. A shop completed in 1896 is still part of the present works.

From 1900 Crompton & Co., Ltd., were recognized as one of the leading electrical manufacturers, and in 1927 the amalgamation took place of Crompton & Co., Ltd., and F. & A. Parkinson, Ltd., to form Crompton Parkinson, Ltd. Landmarks in the history of the company since the amalgamation are its association with the British Electric Transformer Co., Ltd., and Derby Cable Works, Ltd., in 1932, the acquisition of the Young Accumulator group in 1941, and the formation of the joint company, with the Austin Motor Co., Ltd., of Austin Crompton Parkinson Electric Vehicles, Ltd., in 1947. In that year also Crompton Parkinson acquired Cooke & Ferguson, Ltd., manufacturing switchgear and Nelson stud welding equipment. Outstanding developments have been the building of the lamp factory at Guiseley in 1938, and a high-power, short-circuit testing station which was put into commission in 1939 at Chelmsford. There are now factories controlled by the group at Newport, Guiseley, Doncaster, Chelmsford, Derby, Hayes, Manchester, and Glanamman.

Overseas, the company has manufacturing and/or marketing interests in Australia, New Zealand, India, Pakistan, South Africa and Canada.

Part of the historic collection of Crompton machines designed during the period 1880-1902. The machine in the foreground on the central plinth is a Crompton-Burgin generator (1880). To the left of it is a three-phase induction motor (designed about 1901)

Electric Drive Transmission

Diesel-Electric Crane Drive

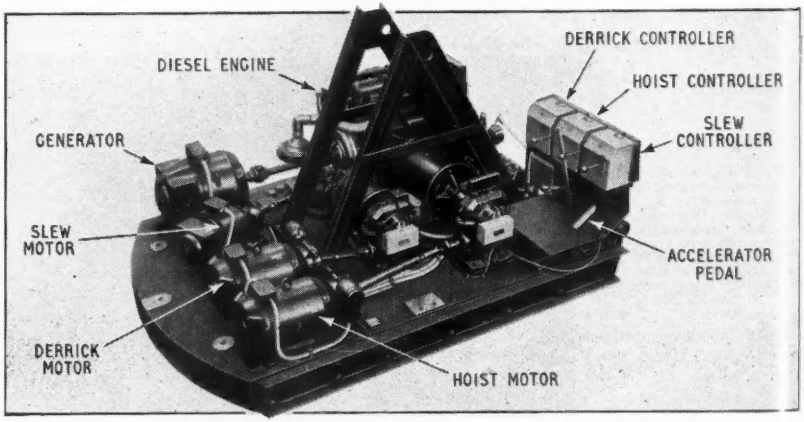
ONE often hears it said or implied that there are complexities associated with electric driving transmission, such as is employed in many types of diesel- or petrol-electric traction, propulsion and materials handling equipment, which render the operation of such equipments so difficult that it is inefficient, or that the maintenance of the electric drive transmission requires specialist attention of such a high order as to make the care of such a system impracticable or non-commercial. Then one hears talk of lowered efficiency by the use of a separate motor for each motion, without reference, of course, to the very greatly enhanced flexibility of the individual driving which adds so enormously to the overall efficiency of the ultimate operation, whatever the application may be.

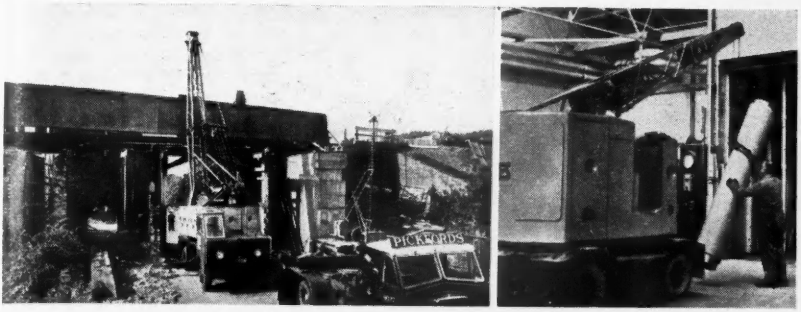
To show the fallacy of the above arguments we need only point to the ever expanding and successful use of diesel-electric main propulsion on train and ship throughout the world. Nevertheless we welcomed the opportunity a few days ago to judge from personal experience the simplicity of operation of diesel-electric driving in one particular industrial field—materials handling—by a visit to the crane works at Sunderland of Steels Engineering Products, Ltd.

A brief tour of the works, during which we saw most of the main components of the Coles crane constructed and assembled from the receipt of the raw materials to the finishing operations on the completed crane, and finally actual personal operation of all the motions—travelling, derricking, hoisting and slewing, at all speeds—all confirmed our initial impressions of simple layout, easy maintenance and exceptional flexibility of control of the electrical equipment and its operation.

The mobile Coles cranes are made in a wide range of styles relating mainly to their mode of propulsion and method of mounting or housing; for instance, to name a few, there are the self-propelled, lorry mounted and rail mounted cranes, each particularly suited to one or more specific fields of

The layout of the electrical equipment has an important bearing on the flexibility of control





The largest (20 tons, left) and smallest (one ton, right) Coles cranes are doing good work in bridge building and h.v. insulator bushing mounting, respectively

materials handling. These cranes at present vary in sizes relating to load capacities from the largest of 20 long tons to a one-ton equipment, and we think it will be sufficient to give details of one example each of the largest and smallest in the range.

The model S-2310 crane is a self-propelled mobile crane with a loading capacity of 20 long tons at a jib radius of 10ft. The main power unit is a 70 h.p. petrol or an 80 h.p. 2,500 r.p.m. diesel engine directly coupled to a variable voltage commutating pole shunt generator for supplying the d.c. variable voltage series high torque/low speed characteristic motion motors. Single line hoisting pulls are 11,000, 5,000 and 2,250 lb with speeds of 60, 90 and 120ft per min., respectively. The slewing speed is 1·5 r.p.m., while derricking from maximum to minimum radii takes place in 90 seconds. Travelling speeds are up to 2 m.p.h. loaded on level ground and up to 8 m.p.h. unloaded on level ground. The travelling turning radius is 30ft and the overall weight with a standard jib is about 27 tons. At the other end of the range is the model S-25 one-ton crane in which the power unit is a 17 h.p. 2,000 r.p.m. petrol engine. The generator, driving motors and control gear in this case are similar in most respects to those of the largest crane, except for size.

With an eye on the main purport of this article we stress the simplicity of layout of the electrical equipment which is indicated in the accompanying illustration and in the following notes, and which has so important a bearing on the flexibility of control of the crane driving.

There are three motors on the superstructure which are used to drive the hoist, derrick, and slew motions, respectively, while self-propelled and dual drive cranes are also fitted with a traction motor on the chassis. The generator may be situated on the superstructure or, as on some lorry mounted models, situated on the chassis where the drive to the generator is by power take-off from the engine main gearbox. The motors and generator are all totally enclosed and weatherproof, and fitted with dustproof bearing caps, with arrangements for grease gun lubrication of the ball and roller bearings. All the machines are specially constructed for mobile crane work.

Designed for heavy duty crane operation, all the controllers are of the contactor type, giving forward and reverse motions only, and are not used for speed control in any way. On hoist and derrick motions a special auxiliary switch is provided to enable limit switches, controlling a hold-on coil, to be operated from the starting battery. The hold-on coil on the controller maintains the line contactor closed when the controller is operated. If a limit switch is opened the contactor automatically breaks the line circuit, thus stopping the motor in that direction.

The electromechanical brakes are entirely automatic in action, and are mechanically applied by spring pressure and released electrically by electromagnetic coils, energized by the main current, whenever this is passing through the motor. The springs automatically apply the brakes immediately the circuit is broken (*a*) by the operator returning the controller handle to neutral position, (*b*) by failure of the main current

through any defect, (*c*) by operation of the limit switches, or (*d*) by failure of the battery circuit due to a "flat" battery or other defect. In the case of the crane with twin hoisting barrels, the electro-mechanical brakes hold the barrels only so long as the air clutches are engaged, otherwise (for gravity lowering) the control of the barrels is dependent on the band brake foot pedals or the emergency hand brake.

The automatic safe load indicator consists of a weatherproof box in which is housed the actual weighing mechanism. This box is mounted in a convenient position on the crane according to the layout of the machinery, so that the varying loadings on the hoisting or derricking ropes as the radius of the jib is changed can be transmitted to the operator in the form of a simple signal.

The indicator weighs the load, and if the weight exceeds the rated level for the radius at which the jib is set, a switch in the indicator opens and breaks the hoisting and derricking-out circuits. Visual and audible warning of overloading may be incorporated, but the breaking of the circuit or circuits is entirely automatic, and quite divorced from any action on the part of the operator.

Since the derrick rope force at any radius is a measure of the crane's stability, the safe load indicator has been inserted in the derrick rope system to measure this force. One pulley of the derrick rope system at top of the "A" frame is independently mounted on a bellcrank lever which is pivoted on a bracket fixed to the crane and is prevented from rotating by being anchored back to the crane structure by means of the indicator. Any increase in force in the derrick rope causes a proportionate increase in tension between the two end bolts of the indicator, and as the maximum safe load is approached contacts operate, either to actuate the cut-out or give warning by lights and bell. To allow for the difference in permissible maximum safe load for each different radius of the crane, a cam is caused to rotate to a different position at each radius.

When magnet equipment is fitted to the cranes, the magnet itself must be energized from a constant voltage supply, and as the main generator voltage varies in accordance with the demands created by the operator's foot throttle, a separate means must be found of supplying the current. This is achieved by fitting an auxiliary generator which is driven by vee belts from the main generator pulley, and has a contactor and a specially designed carbon pile voltage regulator incorporated in the field circuit. The regulator is fully automatic and is accurately adjusted before leaving the works. The resultant voltage is constant to $\pm$ 10 per cent over a range of generator speeds from 600 r.p.m. to 3,000 r.p.m.

Electricity Supply Salaries

TO keep its members informed of matters affecting their salaries and conditions of service the Association of Managerial Electrical Executive has begun a journal. The first issue, dated September, contains particulars of the new salary proposals being considered by the National Joint Managerial and Higher Executive Grades Committee (Electricity Supply Industry).

At a meeting in August the chairman of this Committee (Sir Henry Self) referred to the differences between the proposals of the Boards and those of the officials' associations and suggested that the new scales should be applied forthwith (with effect from 1st April, 1952), adjustments to be made subsequently.

On behalf of the staff side, Messrs. H. Norton (E.P.E.A.) and I. W. Thomas (A.M.E.E.) said that this proposal was not acceptable as the scheme left too much to the Boards' discretion in allocating posts to salary grades. Finally it was decided to appoint a sub-committee to consider the differences between the two sides' proposals and report to the full Committee.

During the proceedings it was announced that the Boards proposed to raise Scale 7 from £1,850–£2,000 to £1,950–£2,100 and to add £50 per annum to salaries in the London "weighting" area. Another proposal was that salary scales for Sub-Area managers and chief generation engineers should be as follows:—Scale 1, £2,200 × £75 to £2,500; Scale 2, £1,900 × £75 to £2,200; Scale 3, £1,600 × £50 to £1,900.

The Association felt that interim increases should be considered for employees on salaries of £2,000 and over and the chairman said that the Boards' members agreed that it was reasonable to re-examine the position of these employees, in view of the proposal to increase Scale 7 to £2,100.

The *Journal* reports that Mr. A. Kelso (manager, Glasgow Sub-Area) has succeeded Mr. G. I. Moody as president of the A.M.E.E.

COMMERCE and INDUSTRY

Large Works Canteen

Stabilization of Tinplate Prices

ONE of the biggest and most up-to-date industrial canteens in this country was opened on 26th September at the Woolwich Works of Siemens Brothers & Co., Ltd. The new canteen which has cost £120,000, has taken two years to build and will accommodate nearly 1,400 at one sitting. It is air-conditioned throughout and its amenities include a fully automatic washing plant, refrigerated stores and showers for the canteen staff.

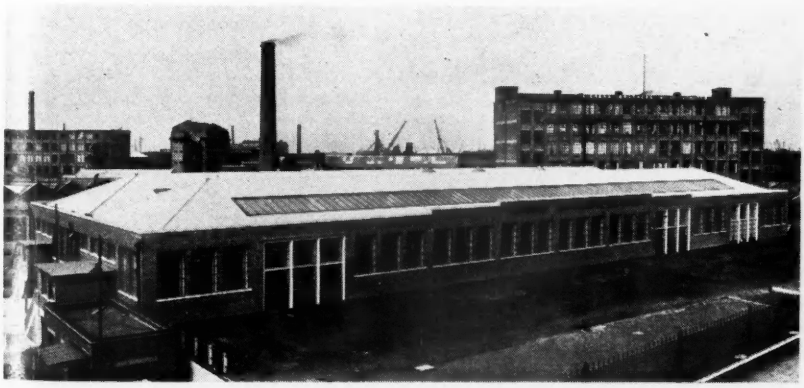
The opening ceremony was performed by Mrs. E. R. Humphries, wife of the managing director of the company. A tour of inspection followed, after which lunch was served in the canteen. Among the seventy guests were Mr. W. A. Steward (M.P. for West Woolwich), Councillor S. L. Collins, J.P. and Mrs. Collins (Mayor and Mayoress of Woolwich), Ald. Mrs. L. Hilldrith, J.P. and Miss Constance Hilldrith (Mayor and Mayoress of Greenwich), Mr. F. P. Greenaway (director of the building contractors) and Dr. Oscar Faber (to whose design the canteen was built). Representing Siemens were Sir William Morgan (chairman), Sir Hubert Gough, Mr. H. E. Humphries (managing director), Mr. W. G. Patterson (deputy managing director), Mr. G. W. Giffin (director and general works manager), Mr. S. W. Lumb (company secretary), and Dr. J. Montgomery (works medical officer). The company's employees were represented by members of the staff and the Co-operation Committee. After lunch the guests joined in a tour of the works, along with some 4,000 of the firm's employees and their families who took advantage of the annual "Open Day" to see manufacturing processes and enjoy the company's hospitality at tea time.

Aluminium Supplies

A visit was paid recently to the Falkirk rolling mills of the British Aluminium Co. by Mr. K. A. Gbedemah, Minister of Commerce and Industry, Gold Coast, and other Gold Coast representatives. Speaking at a luncheon on this occasion, Mr. G. Boex, the company's managing director, said that the power produced by the North of Scotland Hydro-Electric Board was not sufficiently cheap for the production of aluminium and consequently home production of this metal was likely to remain at the present level of 30,000–40,000 tons a year. But more than this was required and other sterling area resources would have to be examined. One of these was the Gold Coast where the Volta River scheme might enable the United Kingdom to obtain a large tonnage of aluminium at a competitive price.

Mr. Gbedemah said that the execution of the Volta River scheme was by no means a foregone conclusion. There was in the area one of the greatest bauxite deposits in the world and

The new canteen at the Woolwich Works of Siemens Bros. & Co., Ltd. The forecourt will later have ornamental gardens



there was sufficient power in the Volta River to provide for the manufacture of aluminium on a large scale. But the Gold Coast Government wanted to be sure that any development would be to the advantage of the people.

Electric Furnaces in South Africa

In his speech at the recent annual meeting of the African Metals Corporation in Johannesburg, the chairman (Dr. F. Meyer) said that an increase from 21,400 to 34,603 tons from the Ferro-Alloy Works at Vereeniging and Kookfontein was due to a full year's operation of two new electric furnaces at Kookfontein. A new 7,500 kVA electric tank furnace was being installed at this works and furnaces from Vereeniging were being transferred there. When these were in operation the works would have an installed capacity of 42,000 kVA of electric furnaces.

Diesel Sets for Gold Coast

The National Gas and Oil Engine Co., Ltd., has received an order from the Crown Agents for the Colonies for two 1,250 kW diesel engine-driven alternator sets each of which will comprise a National B4AU8 type 8-cylinder 333 r.p.m. pressure charged vertical engine coupled to a 11,000 V alternator manufactured by the Brush Electrical Engineering Co., Ltd. These sets are for extensions to the Kumasi power station.

Contractors' Year Book

A new edition of the E.C.A. Year Book is now available (Electrical Contractors' Association, 14, Bedford Row, London, W.C.1, price 15s, postage 1s). On the general information side this follows previous editions, but the membership section has been completely re-arranged. The new system makes it much easier to find the contractors in a particular town; London contractors are classified according to their postal districts. There is also, of course, the usual alphabetical list of names, indicating members' towns.

Tinplate and Terneplate Prices Stabilized

The Minister of Supply has, after consultation with the Iron and Steel Board, made an Order, the Iron and Steel Prices (No. 5) Order, 1953 (S.I. 1953 No. 1438), affecting tinplate and terneplate prices. The Order increases the basic prices for tinplate and terneplate by 1s 8d per box and 6d per box, respectively, and for the appropriate extras by corresponding amounts. But in consequence of the price changes resulting from the operation of the "automatic variation adjustments" for tin and lead, the maximum prices for tinplate and terneplate will remain unchanged. The purpose of the Order, which has been made on the recommendation of the Iron and Steel Board, is to continue temporarily the stabilization of the maximum selling prices of tinplate and terneplate pending further examination of these prices by the Iron and Steel Board.

Belfast Boiler Plant Contract

Belfast City Council, at its meeting on 1st October, agreed to the recommendation of its Electricity Committee that tenders for the boiler plant for the Victoria power station should be invited by public advertisement. The minutes of the Electricity Committee, which were passed, contained a letter from Merz and McLellan, consultants, stating that it was their view that the time was now past for commissioning plant for the winter of 1956–57, and that the only proper course to pursue now was to re-cast the construction programme to provide for commissioning plant for the winter of 1957–58.

Alderman M'Kee, whose action against the Council in this matter was successful, remarked that he had never accepted the argument of urgency in placing the contracts.

Swiss Television Order

Orders for three complete "Emitron" mobile television microwave links have been received from the Swiss Post Office by Electric & Musical Industries, Ltd. These links are used to relay outside broadcast television programmes from location to the main transmitter and consist of a transmitter and receiver each with a parabolic aerial and mounting.

Boiling Plate Showcard

The accompanying picture shows a new showcard advertising "Redring" radiant

"Metrovick" boiling plate showcard

boiling plates manufactured by the Metropolitan-Vickers Electrical Co., Ltd. It is printed in ten colours with the actual plate embossed to increase the third dimensional effect. Supplies are available from all "Metrovick" district offices.

Hull Electrical Exhibition

A special exhibition of electric lighting fittings, glassware, electrical appliances, bathroom suites, etc., is being held in the showroom of T. B. Morley & Co., Ltd., Jameson Street, Hull, from 12th to 16th October.

"Copper in Instrumentation"

In our issue of 14th August we referred to a new publication "Copper in Instrumentation," issued by the Copper Development Association. Copies are obtainable, free, from the Association at Kendals Hall, Radlett, Herts.

New Service Centre

The Boston District of the East Midlands Electricity Board has opened a Service Centre at 18, Victoria Road, Mablethorpe (Telephone: Mablethorpe 2148) and manufacturers of domestic apparatus and fittings are asked to send lists etc. to this address.

Works Visit

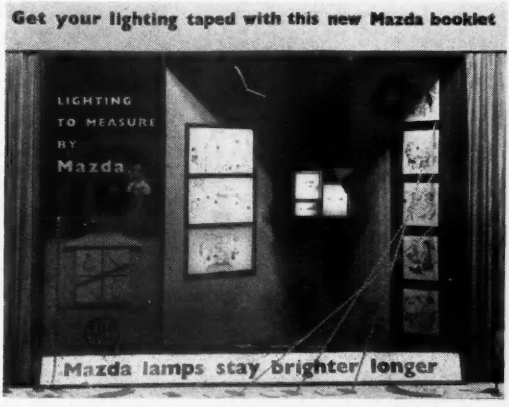
On 30th September, Alderman A. E. Bennett, Lord Mayor of Stoke-on-Trent and a member of the Midlands Electricity Board, accompanied by Mrs. Bennett, paid a visit to the Blythe Bridge works of the Simplex Electric Co., Ltd., and witnessed the production of "Creda" electric cookers, water-heaters, fires and lighting fittings. The party, which, in addition to other members of the City Council, included Mr. J. J. Glover, secretary, North Staffs Chamber of Commerce, Mr. L. de Cecco, Mr. G. S. Buckingham, chief purchasing officer, M.E.B., Mr. H. A. P. Caddell, manager, Mr. T. Lockett, commercial officer, Mr. R. M. Stewart, chief accountant, and Mr. C. C. Pimble, chief engineer, North Staffs Sub-Area, M.E.B., were welcomed by Mr. E. G. Plucknett and Mr. A. G. Jones, directors and joint general managers of the company and by Mr. V. J. Adams, works manager. At the lunch which followed the tour of the works, Alderman Bennett said that his visit to Creda Works gave him the dual opportunity of calling attention to the menace of "smog" and to correct the impression that the industrial life of the Potteries was only confined to making pottery and mining coal. At the Blythe Bridge works there was a diversity of products which would allow the housewife to throw away her coal scuttle, her ashpan and her firelighters. This was one very tangible contribution from the Potteries to a healthier, cleaner age.

The Lord Mayor and Lady Mayoress of Stoke, Alderman A. E. and Mrs. Bennett, inspecting the "Creda Comet" electric cooker with Mr. E. G. Plucknett (in the foreground), director and joint general manager of Simplex Electric Co., Ltd., and members of the City Council

"Lighting to Measure"

The latest window display at Crown House, Aldwych, is based on the Mazda booklet "Lighting to Measure," the spearhead of the B.T.H. campaign for better lighting in the home during the coming winter. An exhibition of a

The "Lighting to Measure" window display by the B.T.H. Co. at Crown House, Aldwych



series of furnished " rooms " correctly lighted in accordance with the simple " tape measure " instructions in the booklet is open at Heal & Son, Ltd., Tottenham Court Road, until October 24th.

Coryton Oil Refinery

A Press visit was recently paid to the Vacuum Oil Company's new refinery at Coryton, where Nos. 2 and 3 boiler units have now started up and the distillation unit, the thermal reformer, the gasoline treating unit, and the ethyl blending unit have been completed. The Thermofor continuous percolation unit and the T.C.C. unit are also now rapidly approaching completion. The latter will use the air-lift principle to return the regenerated catalyst to the reaction chamber, and will be the first of its kind in the United Kingdom. A detailed description of the installation appeared in our issue of 3rd April, page 731.

Prices of Materials

In the accompanying table we give the basis prices of the more important materials used in the electrical industry. The figures are those quoted on Monday last.

ALUMINIUM Ingots	ton £150 0s 0d
COPPER, H.C. Electro	ton £232 10s 0d
Fire Refined 99·70 per cent ..	ton £231 0s 0d
Fire Refined 99·50 per cent ..	ton £230 0s 0d
COPPER Tubes	lb 2s 3½d
Sheet	ton £294 0s 0d
H.C. wire and strip	ton £267 0s 0d
LEAD, English	ton £90 15s 0d
Foreign	ton £89 0s 0d
MERCURY	flask £64 15s 0d
TIN	ton £610 0s 0d
ZINC, G.O.B. Foreign	ton £71 0s 0d
Electrolytic	ton £72 5s 0d
BRASS Tubes	lb 1s 10¾d
Sheet	ton £233 15s 0d
Wire	lb 2s 5¼d
PHOSPHOR BRONZE	
Wire	lb 3s 8¼d
RUBBER, No. 1 R.S.S. spot ..	lb 18d–18¼d

Hoover Factory Extension

Additions to the Hoover washing machine factory at Merthyr have now been completed, giving it a floor area of 241,890 sq ft, making it three times its original size, while employment has risen from a few hundreds to over 1,300.

New E.R.A. Laboratory

The Electrical Research Association has decided to place the contract for its new laboratory at Leatherhead with G. Walker & Slater, Ltd.

Advertisement Corrections

In an advertisement in our issue of 25th September the English Electric Co., Ltd., stated that the fluorescent lamp on its " 2011 " cooker was an optional extra. Actually it is a standard fitting.

An error occurred in the price given for the " Westminster " door chime of V. & E. Friedland, Ltd., in their advertisement in our 2nd October issue. It should have been 168s, not 68s.

Trade Announcements

Mr. W. F. Lorch tells us that he and his family have purchased the equity in **Elga Products,** Elga Works, Railway Place, Wimbledon, S.W.19, from Falk, Stadelmann & Co., Ltd. The company makes domestic appliances, including the " Gadabout " travelling iron, the " Clearline " kettle and the " Auto-Perc " coffee maker. Distribution will be direct to wholesalers, retailers and Electricity Boards, and all products will carry a three-year guarantee.

On and after 12th October the **Wandsworth Electrical Manufacturing Co.'s** London office and showroom will be at 136, Cromwell Road, Kensington, S.W.7 (telephone : Fremantle 6425).

The Manchester office of the **English Electric Co., Ltd.,** has been transferred to Croxley House, 14, Lloyd Street, Deansgate, Manchester, 2 (telephone : Deansgate 7872/6).

G.P.U., Ltd., and its subsidiary the **Electroplant Co.,** have moved to their new West End office at 44, Bryanston Street, London, W.1. (off Marble Arch). The works and stores have now been transferred to their associates H. Fisher (Oldham), Ltd.

Wolf Electric Tools, Ltd., has opened a service branch at 322, Scotswood Road, Newcastle-upon-Tyne, under the supervision of Mr. R. Montgomery.

Siemens Electric Lamps & Supplies, Ltd., 38-39, Upper Thames Street, London, E.C.4, announces that it is now manufacturing cycle dynamo lamps. Whilst all ratings are not immediately available, both head and tail lamps in the popular ratings are obtainable from stock.

The address of **Hifi, Ltd.,** is now Derry Works, Derry Street, Brierley Hill, Staffs.

Information Department

THE extensive records of our Information Department enable us to reply to most queries, but occasionally we ask our readers' assistance in tracing names and addresses not known to us. We should be glad to have such information regarding the makers of the following:—

" Elmatic " clamping elements.

General inquiries from readers relating to sources of electrical goods, makers' addresses, etc., are replied to by the Information Department through the post. Inquiries should be accompanied by a stamped addressed envelope.

RECENT INTRODUCTIONS

Notes on New Electrical and Allied Products

Domestic Kettle

THE latest "Fylon" domestic kettle to be introduced by PREMIER ELECTRIC HEATERS, LTD., Keeley Street, Birmingham, 9, is fitted with a 1,000 W or 1,500 W element at a cost of 52s 6d or 55s 6d respectively. The kettle is of streamlined appearance and is made of highly polished aluminium, the element incorporating a fully automatic safety device.

"Pylon" 1,000 W or 1,500 W kettle

Decorative Lighting Fittings

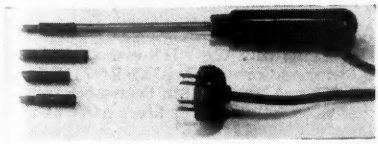
The decorative appearance of Christmas tree lighting sets can be greatly improved by means of the coloured, glitter edged stars now being placed on the market by J. D. WYATT, 42, Priory Road, Barking, Essex.

These stout cardboard, star-shaped cut-outs measure 4in across and are simply fixed by first inserting the bulb through the centre hole of the star before screwing into the holder. Cellophane packets containing one dozen stars in assorted colours retail at 7s 6d.

Low Voltage Soldering Irons

Soldering irons designed for use in the manufacture of electronic equipment are now available from the ELECTRICAL REMOTE CONTROL CO., LTD., East Industrial Estate, Harlow New Town, Essex. The small dimensions (diameter not exceeding $\frac{5}{16}$in anywhere outside the handle) and complete insertion of the 20 V element inside the copper bit result in maintenance of high, concentrated heat during continuous soldering. Four types of interchangeable bits with ends between $\frac{5}{32}$in and $\frac{5}{16}$in diameter are available. The rating is 35 W, length 9$\frac{1}{2}$in and the weight 2$\frac{3}{4}$ oz. These irons have been designed primarily for use on the company's low voltage soldering iron busbar installation, but they can, of course, be used apart from this.

ElRemCo low voltage soldering iron



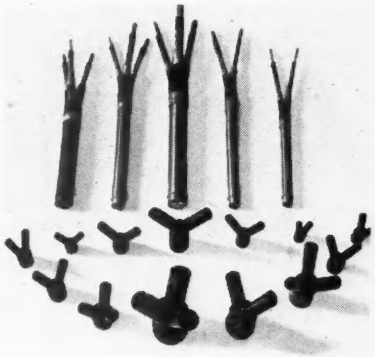
New Decorative Bulb Set

Bigger decorative "Osram" bulb sets are being marketed by the GENERAL ELECTRIC CO., LTD., for the Christmas trade. The sets have a 12-lamp beaded string in a straight line on a green braided flexible with a 16ft span. Skirted m.e.s. holders provide an added safety precaution. The 20 V, 6 W lamps are roughly comparable with the pre-war 14 V, 7 W lamps. Two spare lamps are included with each set which will be boxed in an attractive container. The catalogue number of the "Osram" large bulb set is OS2000, list price 33s 4d (purchase tax 6s 2d extra). Spare bulbs are listed at 1s 2d each —purchase tax 3d extra. The "Party Light" set (OS2102) will also be marketed as last year but the list price, with shades, has been reduced from 28s to 25s (revised purchase tax is 4s 8d).

Cable Sealing Sleeves

A range of polychloroprene sealing sleeves for terminating cables used in normally dry conditions has just been introduced by BRITISH INSULATED CALLENDER'S CABLES, LTD., 21, Bloomsbury Street, London, W.C.1, for use where sealing by the more orthodox method

B.I.C.C. cable sealing sleeves

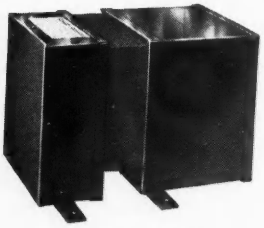


is considered unnecessary. The sleeves have been developed for use on medium voltage, two- and three-core, cambric-insulated cables, and are particularly suitable for ship wiring. The range is to be extended, however, to cater for mass-impregnated non-draining power cables for industrial installations generally.

The sealing sleeve, which is fitted over the prepared end of the cable as illustrated, is a valuable means of terminating cables where space is a consideration, and where the more complete protection afforded by a compound-filled box is not warranted.

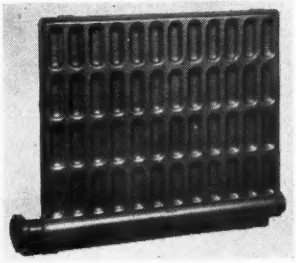
Voltage Booster

The "Advolt" is a single-step voltage booster for use with equipment which might fail to operate or suffer damage if there were a substantial fall in the supply voltage, but where the accurate control provided by a constant voltage transformer is unnecessary. Made by ADVANCE COMPONENTS, LTD., Back Road, Shernhall Street, London, E.17, it is capable of supplying the starting load of many motor operated devices. It is completely automatic and comprises a boost transformer, switched by a relay which is controlled by a voltage sensitive device designed to ensure accurate placing of the operating points. The load capacity of the unit is 2,000 VA and the voltage boost 12 per cent. The line voltage for boost action is:—pull-in 200 V, drop-out 210 V.



"Advolt" voltage booster

"Dimplex" gas-tight panel type radiator



The overall dimensions are 8⅝in long by 7½in wide by 5½in high. The weight is 16 lb.

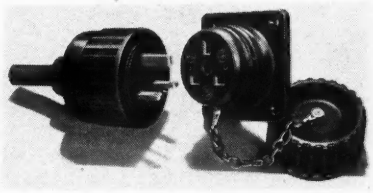
Oil-filled Radiators

Several new models of its oil-filled electri radiators have been introduced by DIMPLEX, LTD., Totton, near Southampton. Among these are flameproof and gas-tight radiators. The former have gained a Buxton certificate (Groups II and III) and are suitable for spray booths, paint stores, garages, etc. They are produced in panel or column form. The panel pattern is made in six sizes with loadings ranging from 0·5 to 2 kW; there are two sizes of the column pattern with 1½ or 2 kW loading. The flameproof radiators are produced for operation at 110, 200/220 or 230/250 V; the gas-tight models (designed especially for use in hospitals) are made for 200/220 or 230/250 V (maximum loading 2 kW) or for 110 V a.c. (up to 1½ kW) or 110 V d.c. (up to 1 kW). The standard finish is light bronze but the radiators can be had in coloured finishes without extra charge. All standard radiators are fitted with thermostatic control and pilot lights.

Another development is the provision of a detachable chromium-finished towel rail for neatly fitting on the top of a radiator.

Heavy Duty Plug and Socket

A 13 A heavy duty plug and socket moulded in a non-hygroscopic phenolic material which



"Ekco" 13 A heavy duty plug and socket

is virtually unbreakable is now available from E. K. COLE, LTD., Plastics Division, Southend-on-Sea, Essex. The socket is provided with four 4 B.A. clearance holes in the mounting flange and incorporates a captive screw cap to enclose the plug entry when not in use.

The plug incorporates a threaded ferrule to provide positive attachment to the socket and all joints, including cable entry, are completely sealed. It is claimed that a normal connection will withstand such severe tests as being run over by a 5 ton vehicle or being immersed in water to a depth of 5ft.

In dealing with the "D" series switches of the SWITCH & CONTROL Co., Vale Road, Watford, Herts, in our issue of 18th September (p. 634) we inadvertently gave the firm's name as *Time* Switch & Control Co.

BOARDS' ACTIVITIES

Points from the 1952-53 Annual Reports

THE summary of the British Electricity Authority's report published in last week's issue included tabulated details of the sales and financial results of the fourteen Electricity Boards. Fuller details of the Boards' operations are contained in their individual reports, the first four of which are reviewed below. Tariff questions continued to receive attention and efforts were made to keep charges down by administrative economies. The year was marked by the disastrous East Coast floods which affected the systems of the London, South Eastern, Eastern and East Midlands Boards, causing extensive damage.

LONDON

An important decision of the London Electricity Board during the year was to try a two-tier organization in place of the three-tier structure (Headquarters, Sub-Areas and Districts) generally adopted in the industry. It was felt that, in a densely populated and compact area such as London, the relative proximity of District offices to headquarters gave an opportunity for easy consultation on local matters. Experimentally, therefore, the South Western Sub-Area organization was disbanded and its five Districts merged into two with their managers directly responsible to Headquarters. In its report the Board says that economies have already been achieved and it is intended to proceed with further reorganization.

Another direction in which the Board is seeking economies is in the operation of the 80 stores depots, many of them relatively small, which were taken over on nationalization. Centralization of meter repair and testing stations has reduced the number to 12 (against 35 before nationalization).

Further progress was made with the urgent task of reinforcing the transmission system and replacing obsolete parts of the distribution system, though delays in site acquisition and in obtaining materials and plant upset the planned programmes. Moreover, because the required capital expenditure of £8,832,000 had to be limited to £6,600,000 some projects had to be deferred even though this meant taking risks. Six new bulk supply substations, ranging from 15,000 to 240,000 kVA, were brought into use. The net increase in transforming capacity was 357,535 kVA. By the end of its fifth year the Board had spent nearly £26 million to provide security of supplies and meet the increase in demand. The Board faces a considerable task in the standardization of supplies; there are still 638,859 consumers connected to non-standard a.c. systems and 184,844 to d.c. supplies, representing approximately half the total number of consumers.

In the floods in February last the Board's main substation at Belvedere and twenty transformer stations were put out of service, but in 24 hours a supply was available to all consumers in a position to take it.

Technical developments included continued investigation of the thermal effect of district heating mains on cables, and the devising of a simple type of fault passage indicator and an electronic test unit for ripple control relays. The old distribution system in Hampstead is being replaced by a solidly interconnected system which will dispense with the need for automatic switchgear on the h.v. side, and work has continued on the development of suitable l.v. protective apparatus.

SOUTH EASTERN

Once again the South Eastern Board records an increase in "productivity"—smaller staff and expanded sales. Over 31,000 new consumers were connected and 188 million kWh more sold, while at the same time there was a decrease in staff of 240, making a total reduction of 405 in two years. Further amalgamations of Districts reduced their number to 29 compared with the original 55 at 1st April, 1948.

These and other economies enabled the Board to secure a further lowering of the average cost per kWh sold as far as expenditure under its own control was concerned, but the saving was more than offset by the higher price of electricity purchased. The report points out that the rising coal prices affect the South Eastern Board more than any other; in four years the national average price of power station coal has risen by 11s 1d to 63s 8d, whereas in the Board's area the price has gone up by 14s 7d to 74s 10d. In the face of this the Board succeeded in keeping electricity charges to a level not much above that at vesting date (the average price per kWh sold last year was 1·542d against 1·458d in 1947–48) but as from the end of the year an upward adjustment of charges has had to be made.

The Board's millionth consumer was connected during the year, at the end of which the total number was 1,016,547. Flooding along the Kent coast and in the estuaries of the

Thames and Medway in February is estimated to have resulted in a loss in sales of two million kWh. The year was almost completely free of power cuts. For the first time since the Board was constituted there was a fall in load factor and also for the first time the simultaneous maximum demand occurred on a weekday (Monday, 15th December, 6–6.30 p.m.). Reference has been made in previous reports to the occurrence of m.d. on Sundays because of the cooking load and to negotiations with the B.E.A. for revision of the terms of the bulk supply tariff. Recommendations have since been made for freeing week-end and night loads from the demand charge.

Tribute is paid to the work of the Consultative Council, the report remarking that " the Board has had ample demonstration during the past five years of the value in the public interest of a system which—by providing a counterpoise to the Board's policies—secures a balanced representation of views on all proposals for development."

SOUTHERN

One of the matters taken up with the Southern Electricity Board by the Consultative Council during the year was the supply of electricity to premises excluded under existing conditions because gas was available. The Board says that, as a result of the greater latitude allowed in capital expenditure, it has now been able to remove the remaining restrictions on new commitments for supplies to domestic premises. In 1952–53 the number of new consumers connected was 39,789, an increase of 2,930 on the preceding year, reflecting the easing of restrictions on development. Among the premises connected were 1,396 farms (against 1,297). Standard tariffs for commercial premises, churches and other places of worship and farming and horticultural premises were introduced at the end of the year.

Capital expenditure authorized by the Board in 1952–53 amounted to £6,050,000, of which £5,570,000 was for engineering work, including £158,000 for reinforcing the 33 kV system between Portsmouth and Havant; £148,000 for extending the 22 kV system to Hayes, Middlesex; £141,000 for a 33 kV extension to Bagshot, Chobham and Sunninghill, Berks; and £102,000 for a similar extension to Alresford, Hants.

SOUTH WESTERN

The opportunity is taken in the South Western Board's report to review the results of the first five years' operations, and a separate illustrated booklet has been published, for the information of local authorities and other organizations, outlining the Board's policy and achievements. In that period nearly 120,000 more consumers have been connected and supplies given to 45 per cent of the premises in rural areas previously without electricity. The rate of farm connections has been the highest in the country, the number served being increased by 86 per cent.

It is emphasized that better use of electricity by consumers can do more than anything else to reduce costs and improve the economy of the area. By a vigorous policy of sales promotion the Board hopes to carry out a further stage of rural electrification without an undue rise in the average level of line rental charges. At the same time, the Board considers that the disparity between the financial and trading conditions of the Area Boards, because of economic and geographical considerations, should be studied in relation to the general financial arrangements within the industry. The Consultative Council, for its part, once again records its opinion that some form of assistance is required for Boards with predominantly rural areas, either from within the industry or from a national source.

The section of the report dealing with 1952–53 shows that during the year an additional 26,730 consumers were connected, more than in any previous year. The peak of the work of the introduction of standard tariffs and new accountancy methods was passed, and the greater part of the major engineering task of system reinforcement and expansion was completed. The number of staff was reduced by 179 and of manual employees by 226, the problem of redundancy being minimized by transfers to fill vacancies through retirements and resignations.

Illumination Design Course

THE Electric Lamp Manufacturers' Association's lectures for the evening design course will take place on seven consecutive Wednesday evenings, starting on 21st October. The subjects covered include " The Lighting Problem " (E. B. Sawyer), " Electric Lamps " (A. D. S. Atkinson), " Lighting Design " (R. R. Holmes), " Lighting in Architecture " (A. D. Chartres), " Shops " (R. L. C. Tate), " Industry " (J. F. Roper), and " Homes " (Miss Margaret D. Wardlaw).

An innovation this year is a separate series of lectures on the study of electric lamps to be held on Mondays, 16th, 23rd and 30th November. These lectures will be of interest to all those who are concerned with the sale and use of electric lamps, and will all be given by experts on the subject. By dealing only with lamps it will be possible to go into the construction and operation of various types in a more detailed manner than has previously been possible.

Admission to both the evening design course and the specialized lectures is, as usual, free, but it is necessary to apply by 19th October to the Lighting Service Bureau, 2, Savoy Hill, London, W.C.2, for tickets of admission.

ELECTRICITY SUPPLY

Recent B.E.A. Contracts

Increased Charges in the Midlands

CONTRACTS have been placed by the British Electricity Authority during the past month for power stations, transforming stations, and transmission lines amounting in the aggregate to £6,509,280. The principal contracts include the following:—

Battersea power station: Auxiliary power and control cables.—London Electricity Board.

Brighton "B" station: Two 320,000 lb/hr boilers.—Babcock & Wilcox.

East Yelland station, nr. Barnstaple: Structural steelwork for extensions to main building.—John Lysaghts Bristol Works, Ltd.

Brimsdown station, nr. Enfield: 33 kV switchgear and accessories.—British Thomson-Houston Co.

Northampton station: Foundations and culverts.—Mitchell Construction Co.

Nottingham station: Steel framework of boiler and turbine houses.—Dorman Long & Co.

Meaford station, Stone, Staffs: Ash settling ponds.—G. Percy Trentham.

Stourport "B" station: 66 kV switchgear and accessories.—English Electric Co.

Uskmouth station, Newport: One 550,000 lb/hr boiler.—Babcock & Wilcox, Ltd. Station lighting and plug point installation.—London Electricity Board.

Bold station, St. Helens: Condensing and feed heating plants.—Vickers-Armstrongs.

Skelton Grange station, Leeds: Superstructure extension.—Marples Ridgway & Partners.

Wakefield station, Yorks: Ash and dust handling plant.—Babcock & Wilcox.

Fleetwood station: Auxiliary, control and instrument cables.—B.I.C. Construction Co.

Clyde's Mill station, Glasgow: Building work for extensions.—W. & J. R. Watson, Ltd.

Dalmarnock station, Glasgow: Main civil engineering works.—Holloway Bros. (London).

Castle Donington 132 kV and 275 kV substations, nr. Derby: Site and foundation works.—Taylor Woodrow Construction Co.

Toton substation, Notts.: 132 kV switchgear and connections.—General Electric Co.

Drakelow 275 kV substation, Burton-on-Trent: Site and foundation works and buildings.—Sir Robert McAlpine & Sons (Midlands).

Uxbridge–North Hyde: 66 kV and pilot cables.—W. T. Glover & Co.

Uskmouth–Oxford and Portishead–Swindon and tee to Ryeford: 132 kV double circuit line.—Pirelli-General Cable Works.

Ystradgynlais–Hirwaun–Crumlin/Upper Boat: 132 kV line.—J. L. Eve Construction Co.

B.E.A.'s Welsh Proposal

A special correspondent of *The Times* reports that the British Electricity Authority is seeking permission to make trial borings near Cader Idris (Merionethshire) to ascertain whether it would be practicable to construct an underground power station there. The proposal is that a pumped storage scheme employing off-peak steam-generated power might be constructed using Llyn-y-Cau (1,500 ft above sea level) as an upper reservoir and Talyllyn (270ft) as a lower reservoir. The correspondent was told by the B.E.A. that the investigations were purely of a preliminary character to ascertain whether such a scheme would be practicable and economic. But even if this were established there was no certainty that the scheme would be proceeded with in preference to alternative projects elsewhere.

Hire of Refrigerators

Most kitchenettes on post-war estates at Battersea have a recess specially provided to accommodate a modified type of refrigerator which is available at reduced prices to housing authorities. In response to an inquiry by the Housing Committee 148 tenants have so far stated that they wish to hire refrigerators and are prepared to pay an initial charge of £1 and a weekly charge of 2s 6d. The Committee has accordingly approved an estimate submitted by the borough surveyor amounting to £6,132 for the purchase and installation of 148 of these refrigerators. Installation is to be carried out by the Works Department.

Rural Progress in Ulster

Rural development in Northern Ireland is going ahead faster now that the required guarantee has been reduced from 20 to 17 per cent. A member of the Electricity Board said that farmers were being connected up at the rate of over 1,000 a year, which compared favourably with the rate of expansion of rural electrification in Great Britain.

Terms for Supplies

Revised terms for supplying electricity to farms and other rural property have been agreed by the North Eastern Electricity Board after consultations with the National Farmers' Union and the Central Landowners' Association. In villages and hamlets with ten or more premises grouped reasonably together, the Board will provide connections to mains up to 20 yd under ground and 50 yd overhead, at a maximum cost of £26 without contribution. Regarding supplies

to farms, the Board will bear the first £150 of the total cost (excluding meter) of supplying farms from an existing low voltage network; the first £300 of the cost of supplying from a high voltage line up to 11 kV; and the first £400 of the cost of supplying from a line of 20 kV. Where two or more farms are supplied from the same substation there will be an extra allowance of £150.

Larger Rural Allocation

An additional sum has been allocated to the East Midlands Electricity Board for speeding up rural development. Mr. C. R. King, chairman of the Board, gave this information at a meeting of the Consultative Council in Nottingham last week. He said that when the announcement was made in June last that Area Boards as a whole would receive during the next 18 months a further £1,500,000 for rural development, he anticipated that for the present financial year the East Midlands' share would be about £70,000. He had made representation to the Central Authority that the Board's allocation should be increased as steps were being taken to accelerate the programme of rural development. Confirmation had recently been received that the Board would be allocated £146,000 in the financial year 1953–54 and this would prove very useful in speeding up completion of schemes which were already in an advanced stage of development. Rural development was being treated with the greatest possible urgency, but the man-power was a problem. There was a particular shortage of "rough" labour for gangs and because of this they were having to sub-contract some of the work.

Higher Charges in the Midlands

The Midlands Electricity Board announced last week that as a result of increased costs amounting to more than £800,000 annually, most householders and commercial consumers would have to pay more for their electricity after the next meter reading.

Under the new domestic tariff the charge for electricity for private dwelling houses will remain at 4d/kWh for the first 12 kWh a quarter per room, but the secondary rate will be 1d instead of ¾d. Following representations by the Consultative Council an amended tariff is being introduced for such premises as shops, offices, hotels, training establishments, places of amusement, public institutions and churches under which the calculation of the primary block will be graded, the number of kWh charged at this rate being 40 per 100 sq ft for the first 1,000 sq ft of floor area; 30 per 100 sq ft for the next 2,000 sq ft; and 20 per 100 sq ft for the remaining floor area. At the same time the charge is being raised from 3d to 4d, but the follow-on rate remains at 1d. There will be corresponding adjustments to the combined premises (dwelling house and commercial) tariff. There is also an adjustment in the charge for electricity for farming premises, the existing primary rate of 4d being applied to 40 kWh a quarter per 1,000 sq ft of building area instead of 30 kWh as at present.

All these revised tariffs—which all now have a primary unit price of 4d and a secondary of 1d—take effect for electricity used after the normal meter reading following 30th September.

Announcing the new charges, the chairman of the Board (Alderman W. S. Lewis) said that since the Board last raised its charges it had been faced with increases in costs amounting to about £800,000 a year, to which had to be added the loss of upwards of £600,000 sustained in the year ending March, 1953. This loss was due partly to the delayed application of the revisions announced last December, increased costs of capital and rates, and rises in the cost of the materials used in the very extensive development and reinforcement work being carried out.

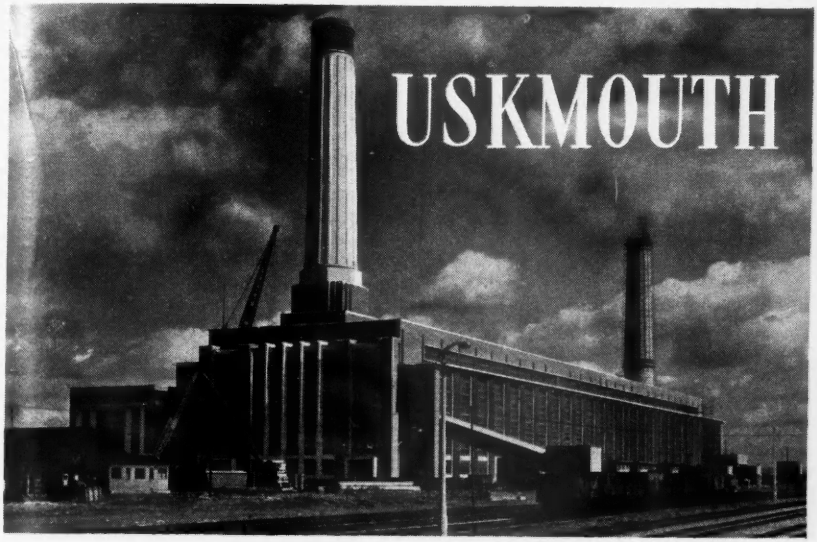
High Eldwick Supply Inaugurated

At a ceremony outside the Fleece Inn at High Eldwick, near Bingley, on 30th September, Mr. Geoffrey Hirst, M.P. for Shipley, switched on the newly connected electricity supply to High Eldwick and the adjoining districts of Drake Hill and Low Springs. Among those present were Mr. O. G. Cook (Keighley District manager of the Yorkshire Electricity Board), who presided; Mr. D. Bellamy (chairman of the Y.E.B.); Mr. J. A. Flanagan (chairman, Bingley U.D.C.); Mr. G. Waddilove (chairman, Shipley U.D.C.); and Mr. P. Oates (chairman, Baildon U.D.C.).

American Lamp "Monopoly"

A UNITED States Federal judge has ordered the American General Electric Co. to "make available to the public all its patents in incandescent lamps and their parts and also its blueprints for lamp machinery." The company, and eight others, which were convicted in 1949 of monopolizing the lamp industry of the United States, were ordered to end contracts and agreements between them for the making of lamps but the judge rejected a Government demand that the company should be required to divest itself of half of its facilities for producing lamps and parts.

The eight firms convicted of aiding the General Electric were the Westinghouse Electric & Manufacturing Company, the Corning Glass Works, the International General Electric Company, N.V. Philips' Gloeilampenfabrieken of Holland, the Consolidated Electric Co., the Hygrade Sylvania Corporation, the Chicago Miniature Lamp Works, and the Tung-Sol Lamp Works now known as the Tungsol Electric Co. The judge said that the Westinghouse and Corning Companies had terminated the case against them previously by giving consent decrees.



New 360 MW Power Station in South Wales

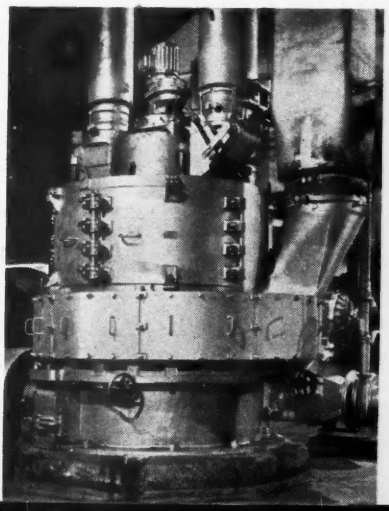
THE new Uskmouth "A" power station of the British Electricity Authority, South Wales Division, was officially opened by the Mayor of Newport, Councillor William Pinnell, B.E.M., on 7th October with the first two turbo-alternator sets in commission. Situated on a 600 acre site where the River Usk flows into the Severn Estuary, the station will have a total generating plant capacity of 360 MW when it is completed, the major plant finally consisting of six 60 MW Fraser & Chalmers–General Electric Co. turbo-alternators and twelve 360,000 lb/hr Babcock & Wilcox boilers. The main building is 896ft long and 270ft wide. The operating floor and basement floor levels are 34ft and 6ft above O.D., respectively.

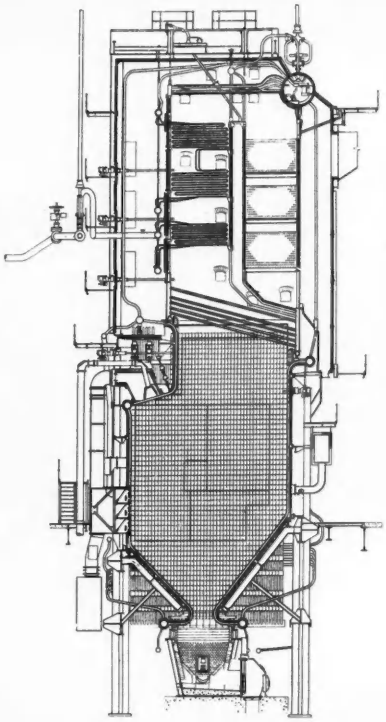
The site is excellent in most respects, but the land is marshy and over 7,000 piles, averaging 55ft long, had to be driven to provide solid foundations. The tidal difference of 44ft made it necessary to build the pumping station below the level of the river bed, a caisson measuring 164ft by 110ft by 80ft and weighing 40,000 tons forming the substructure of the pump house.

Messrs. L. G. Mouchel & Partners are the consulting civil engineers for the station and Mr. Johnson Blackett, F.R.I.B.A., borough architect of Newport, is the architectural consultant.

For the lighting of the approach road and the main area roadways 45 side entry difractor lanterns mounted on 25ft concrete columns with 2ft 6in projection bracket

"Flextooth" crushers reduce the coal to sizes passing a 1in mesh



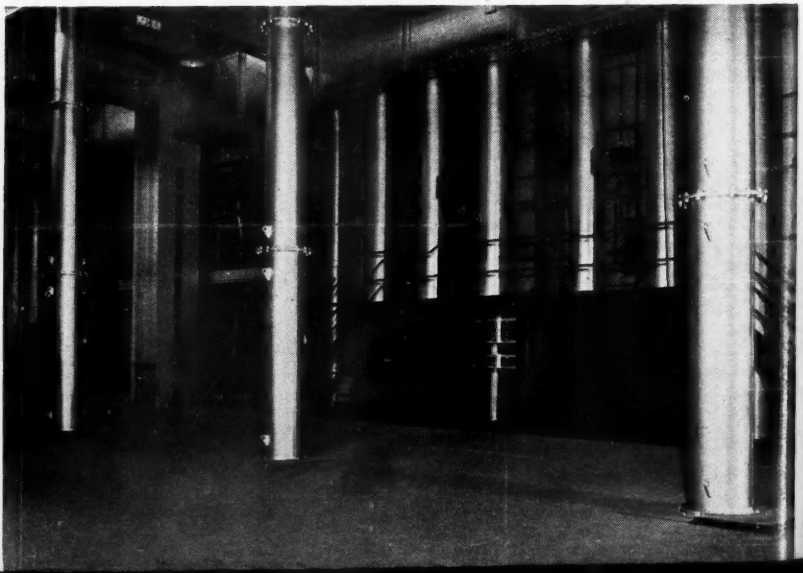


Each boiler is p.f. fired; boiler front

arms are employed. "Osram" mercury lamps are used throughout.

The B. & W. coal handling plant will deal with 600 tons per hour. Railborne coal arrives at a comprehensive system of sidings and full wagons are dealt with by four wagon tipplers working in pairs and feeding underground hoppers. From these hoppers the coal passes over a vibratory feeder to a series of belt conveyors which, commencing underground, emerge and elevate the coal to junction towers. The coal is then delivered to two further conveyors which cross the tracks in overhead gantries at a height of some 35ft and either deliver the coal to radial conveyors for delivery to storage by over-end radial conveyors, or by-pass these and deliver it direct to the reclaiming hopper.

The underground reclaiming hopper is fitted with special grids to take bulldozer tracks, and the coal is fed over vibratory feeders to belt conveyors which transfer the coal parallel to the railway tracks for a distance of some 400ft to crusher houses. In each crusher house the coal is delivered to a "Flextooth" crusher where it is reduced to a size capable of passing through a 1in mesh. Twin crushers are provided in each house, with arrangements for by-passing either, if required. From the crushers the coal falls on to one of two vibrating screens, for removal of non-magnetic rubbish, and it is then transferred to conveyors which deliver it at each end of the boiler house where it is transferred, at 94ft above basement level, to two further unloading belt conveyors running



along the length of the boiler house. The furnaces have water-cooled Bailey walls, and are designed for burning South Wales coal in pulverized form, pulverization being carried out by three " E " mills per boiler. There are twelve vertical intertube burners per boiler, situated near the top of the furnace and firing downwards.

Four retractable pressure-atomizing oil burners per boiler for lighting-up purposes automatically enter through furnace ports when oil pressure is applied and are ignited by a spark from a h.v. transformer. They are extinguished and retracted when the oil pressure is turned off.

The superheaters are of the Babcock multi-loop type and have surface-type attemperators between the primary and secondary stages for control of the final steam temperature. The economiser is of the Babcock multi-loop type with two parallel banks of three sections. The feed water temperature to the economiser is 386 deg F.

There are 27 sootblowers to each boiler unit, i.e., 22 in the furnace and superheater, and the remainder in the air heater.

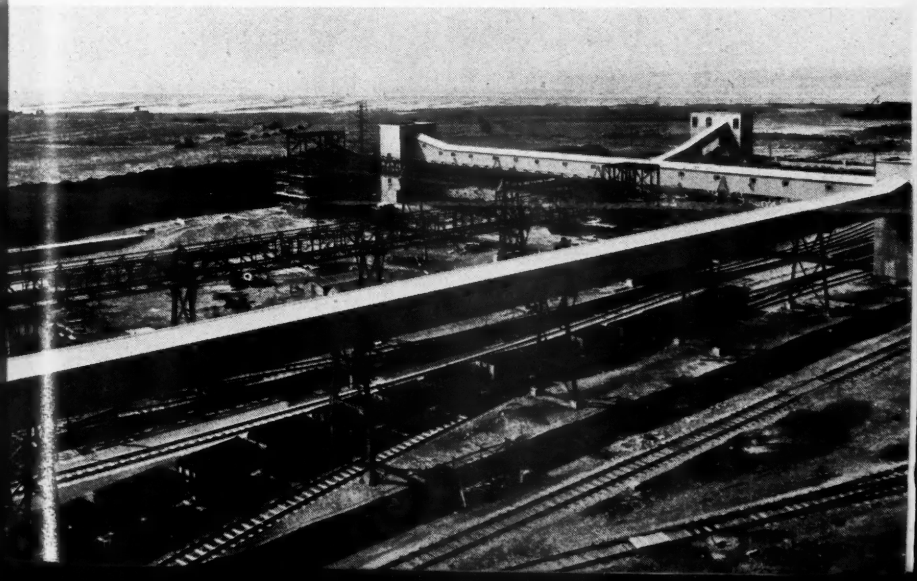
A comprehensive B. & W. installation handles the ash from all twelve boilers which could reach a maximum amount of 100 tons per hour. The 30 ton water filled boiler ash hoppers are periodically emptied through a power-operated door by high-pressure water jets, and the ashes are conveyed by a " Hydrojet " h.p. sluiceway to ash crushers.

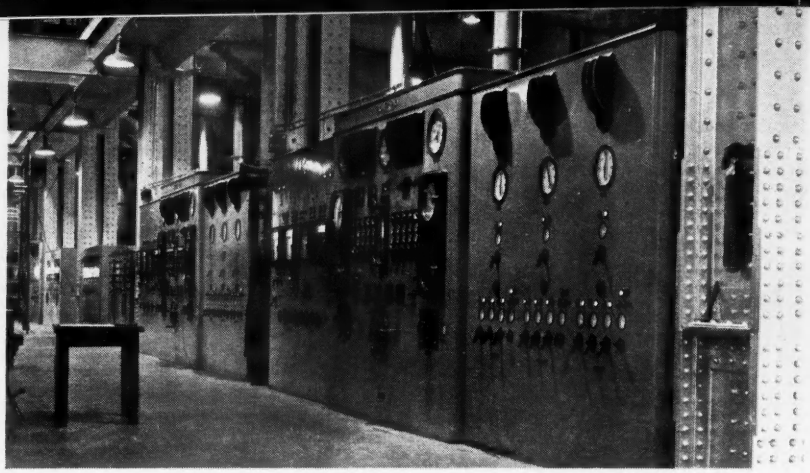
To reduce the emission of smoke and pulverized fuel dust to atmosphere from the twelve boilers Sturtevant electrostatic precipitators are installed, preceded by centrifugal dust collectors. For each of the boilers there is one precipitator which will handle 168,000 cu ft/min of soot and dust at 285 deg F. These precipitators are of the company's latest design, and remove about 6 tons of dust per boiler in each 24 hours when the plant is operating under the design conditions. Each precipitator is housed in a reinforced concrete casing located inside the boiler house, and the gas cleaning plant is under suction between the air heaters and the i.d. fans.

The gas to be cleaned, after leaving the centrifugal collectors, is passed vertically upwards through banks of hexagonal steel tubes in the main body of the precipitator. Down the centre of these tubes are suspended electrode wires charged with a negative potential of 45,000 to 50,000 V. The rapping gear for the removal of the precipitated dust from the electrodes is electrically operated, fully automatic and easily adjustable.

The supply required for " charging " the electrodes is provided by a transformer and mechanical rectifier. In normal operation one h.v. set supplies one precipitator, but the sets are interconnected in pairs, so that one can supply the precipitator for two boilers if the other one is out of service for maintenance. There is a comprehensive system of safety interlocking.

The comprehensive coal handling plant will deal with up to 600 tons per hour





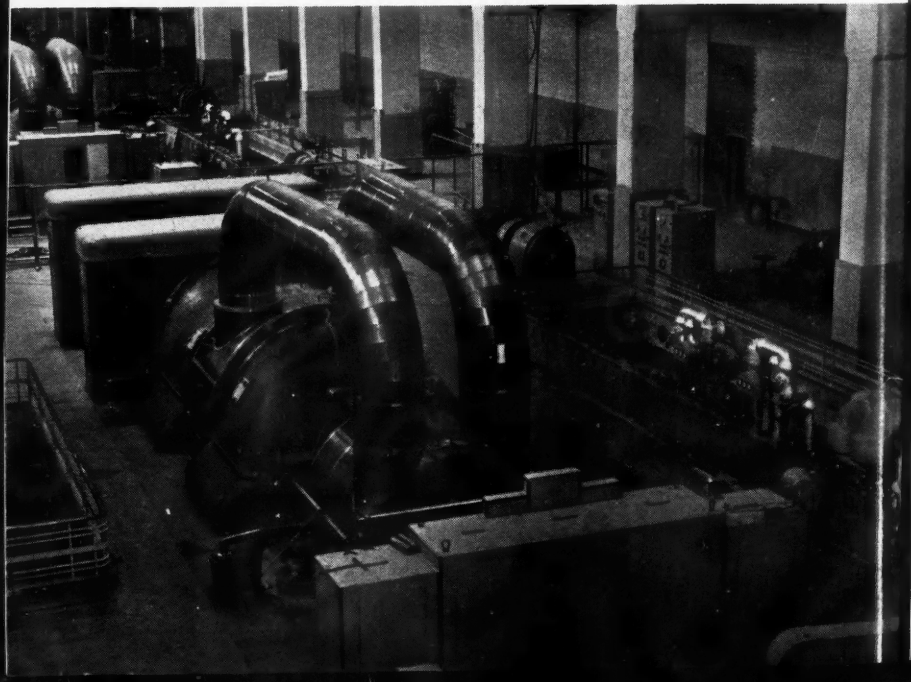
Control board for Nos. 1 and 2 boilers

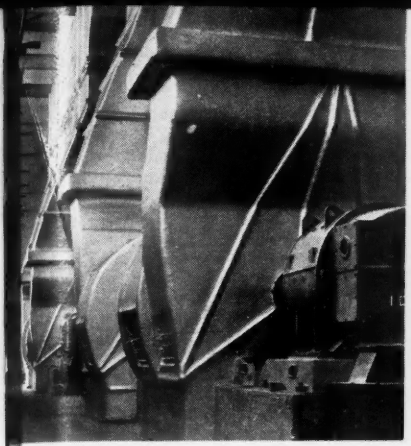
Each boiler is served by two Howden turbovane i.d. fans with an output of 84,000 cu ft/min each, two Howden B forced draught fans of 48,000 cu ft/min capacity, and three primary air fans of 13,500 cu ft/min output.

The f.d. fans draw air from the top of the boiler house and each delivers the air to a rotary air heater from which a system of ducting supplies all the requirements for combustion. The heated air, with the dust and grit, passes through the other sides of the air heaters for heat exchange, and thence to Howden "Centicell" collectors and on to the precipitation plant.

The system of control for the i.d. and f.d. fan motors makes full use of a grid controlled rectifier as a source of power for variable speed d.c. motors. For each boiler the two f.d. fans work as one pair and the two i.d. fans work as another pair, their speeds being controlled automatically by servo-power units which operate phase shifters and so alter the voltage of the

The first two 60 MW turbo-alternators are already in commission at Uskmouth "A"





The i.d. fans for each boiler work as a pair. *Right:* **Drives for c.w. motors in caisson pumping station**

rectifiers which supply power to the motors.

The boilers are connected in pairs to steam receivers which are themselves interconnected for range operation, the steam conditions being 950 lb/sq in, and 925 deg F. The boilers are of the high head type, the main dimensions in each case being: Height, ash basement floor to drum centre, 92ft 6in; width, between centres of stanchions, 60ft; and depth, between centres of boiler stanchions, 27ft 6in. The total overall "width" of each boiler plant, including the pulverizing mill bay and bunkers on one side and the air heaters, etc., on the other side, is 156ft.

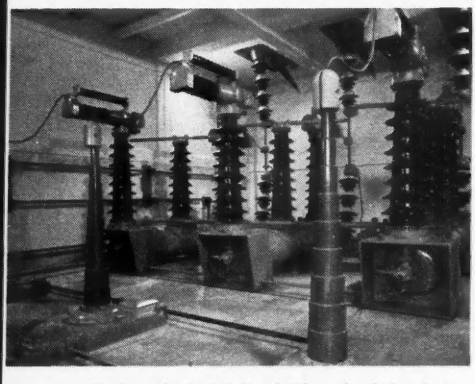
The turbines are designed for a m.c.r. of 60 MW at 3,000 r.p.m., with stop valve steam conditions of 900 lb/sq in and 900 deg F, and a vacuum at full load with circulating water at 56 deg F of 28·9in. Feed water heating is carried out in five stages to a final temperature of 385 deg F.

Each turbine has two cylinders and there are 20 stages in the h.p. casing and six on each side of the double-flow l.p. casing. The steam inlet to the h.p. casing is adjacent to one of the l.p. exhaust casings, so that the steam flows towards the front pedestal and thence through two overhead pipes to the centre of the l.p. casing where the flow divides.

Throttle governing is used from no load to full load, the four governing throttle valves being arranged to operate in parallel to give the m.c.r. at full load. The throttle valves are built into the h.p. casing around which they are arranged symmetrically to ensure uniform distribution of steam which is supplied through loop pipes connected to the two emergency stop valves mounted on foundation girders. Superimposed on the speed governor system are two devices for enforcing a gradual load reduction in the event of either a falling vacuum or a falling boiler pressure.

Steam from each turbine is exhausted into Hick Hargreaves twin condensers from which the air is extracted by two three-stage steam air ejectors. The condensate is drawn off by single stage horizontal extraction pumps which deliver direct to the first stage of the feed heating system, the bled steam from the l.p. system mixing direct with the condensate. Extraction pumps deliver the water to the second l.p. feed heater and the water then passes on to the boiler-feed pump suction. There are eight Mather & Platt electrically driven multi-stage boiler feed pumps and two G. & J. Weir steam turbine driven ones. The latter start up automatically in the event of an electricity supply failure. Make-up feed water is taken from the town's supply. The boilers are automatically controlled by the compressed-air system which governs the fuel and air feeds and the steam pressure.

The condenser circulating water is drawn from the River Usk by eight Gwynnes pumps, each with a capacity of 2·5 million gallons per hour. Owing to the large rise and fall of the tide these pumps are driven by variable speed d.c. motors and they are situated in the caisson pump house as already described. Return



Each of the 21 132-kV air blast circuit breakers has a rupturing capacity of 3,500 MVA

water from the condensers is discharged about 3,000ft higher up the river than the inlet point.

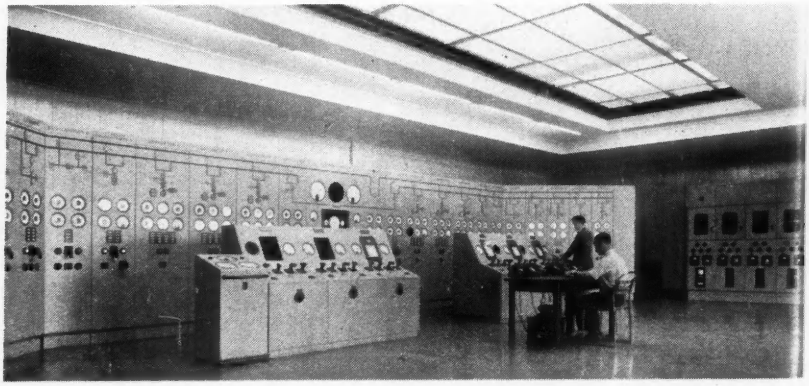
The turbine and alternator rotors are rigidly coupled together, and the only thrust bearing is adjacent to the journal bearing at the steam inlet end of the h.p. rotor. The hydrogen-cooled alternators generate at 11·8 kV, and each one is "tied" to a 70 MVA 11·8 kV/140·7 kV transformer with forced oil circulation and air blast oil cooling.

Alternator switching is carried out on the higher voltage sides of these transformers by 132 kV switchgear which has a rupturing capacity of 3,500 MVA. This Metrovick air blast switchgear is housed in two blocks, one at each side of a central control room. All the switch units are in separate cubicles, connection being made through isolators having synthetic resin-varnish paper condenser bushings of the indoor rocking pattern. Air for operating the circuit-breakers is obtained via a duplicate copper bus main from the compressor room housing two common air receivers in which air pressure is reduced from 600 lb/sq in before entering the duplicate bus main, so as to give a pressure of 325 lb/sq in at the circuit-breaker unit receivers.

The central control room houses the 132,000 V main control board, two generator control desks, an operator's desk, the 3,300 V control board and a voltage regulator panel.

Conditioned air is supplied to all parts of the building, the humidity and temperature of the air in the switchgear cubicles and busbar chambers being automatically controlled by electrically operated dampers at various points on the air ducting, whilst overall control is obtained by electrical operation of the steam supply valves to the air conditioning plant.

Oil-break switchgear for the 3·3 kV auxiliaries and air-break switchgear from the 415 V auxiliaries and the main lighting switchboards were all supplied by the General Electrical Co., Ltd.; lighting sub-switchboards were supplied by South Wales Switchgear, Ltd.; lighting fuse boards by Simplex Electric Co., Ltd.; all the transformers, including the generator, station and unit equipments, by the G.E.C.; and the reactors by the Hackbridge & Hewittic Electric Co., Ltd.



The main control room is centrally disposed between the two main switch blocks

Engineering in Europe

Survey of Current Literature

THE connection of a synchronous generator to an idling transmission line may lead to self-excitation of the generator if the equivalent reactance of the line is within the limits $X_d > X_l > X'_d$. More particularly, if $X_d > X_l > X_q$, the self-excitation is synchronous, and if $X_q > X_l > X'_d$, asynchronous. In the first case, an additional condition of self-excitation may roughly be expressed as $R < (X_d - X_q)/2$, in the second case as $R < (X_q - X'_d)/2$.

Synchronous excitation occurs only on salient-pole generators, whether the exciting winding is closed or open; asynchronous self-excitation only with closed exciting winding. The process is accompanied by current and voltage beats in the case of salient-pole and asymmetrical non-salient pole machines. Synchronous self-excitation causes a smooth variation of current and voltage which then settle to a value determined by the saturation of the machine. Self-excitation can develop only if the remanence voltage of the machine exceeds a critical value, viz., about 0·2–0·4 per cent of the rated voltage. Artificial demagnetization of the generators before raising the voltage on the line (or during this process) may prevent self-excitation and permit of connecting the generators to the line for self-synchronization.

The causes of the unstable parallel operation of two generators on no-load or connected to an idling line of a length below the critical value may possibly be found only in the mechanical part of the unit. Much may be done in this respect by an appropriate choice of the turbine characteristics. Double-system voltage regulators of the proportional type with a reduced setting can always suppress the synchronous self-excitation and permit of a normal synchronization.—" No-Load Conditions in Long-Distance Transmission Systems," V. A. Venikov, L. A. Zhukov and N. D. Anisimoya, *Elektrichestvo*, No. 7, pp. 3–16, 1953, in Russian.

Earthing Arrangements

Surprising as it may seem at first, it must become quite clear on reflection that the theory and practice of earthing are developing into almost a special branch of electrical engineering, and of necessity since the implications of badly planned or constructed earthing systems are serious indeed.

Apart from the necessity of planning the earthing systems, duly separated into service and protective earths simultaneously, and together, with the general layout of the transmission or distribution system which they are to serve, the actual establishment of the earths, i.e., type material and size of the earth electrodes, depth to which they have to be sunk, packing required (if any), interconnection, paralleling, etc., of individual earths, sets many problems of detail which, in turn, depend on a great number of factors which are partly inaccurately known and partly not known at all. For example, the earth resistance at the point of the earth is always variable within wide limits, depending on the composition of the ground, its moisture content, electrolytic characteristics, thermal properties, etc. With the sometimes high densities of the currents dissipated, the temperature rise of the ground may become appreciable, the ground dries up and this may in some cases make the earth resistance practically infinite, so that the earth is no longer " an earth."

The author surveys the whole complex of related problems with special reference to the earthing of power and substations, v.h.v. and l.v. systems and illustration by a few typical examples.—" Earthing Arrangements and Their Utilization in Electrical Installations," J. Gilsoul, *Bulletin Sci. Assoc. Ingen. Montefiore*, No. 4, pp. 305–325, April, 1953, in French.

Readers who require accurate full translations of any of the articles abstracted in this section can be put into touch with the translators who will supply them at current rates.—Editors, *Electrical Review*.

Financial Section

STOCKS and SHARES

STOCK Exchange markets have been displaying, generally speaking, robust strength, with prices rising and business broadening in many directions. The aftermath of last month's reduction in the Bank Rate was followed by a series of good annual reports from industrial companies, and by the investor's practical appreciation of the excellent earnings with which dividend distributions are shown to be covered. By raising its interim dividend from 5 per cent to 6 per cent, the giant Imperial Chemicals Company provided a stimulus to optimism.

The Rising Tide

Babcock & Wilcox rose 4s 9d to 71s 3d upon announcement of a scrip bonus of one new share for every £2 stock held. Four million pounds of 4½ per cent debenture issue, redeemable 1980, has been offered at 97½. The subscription lists opened and closed on Thursday in this week. Rises of 4s in C. A. Parsons and 5s in Reyrolle lifted the prices to 76s 6d and 70s respectively. Associated Electrical Industries at 82s 3d, Lucas at 46s 3d, and London Electric Wires, 68s 3d, are substantially higher. Ericsson Telephones rose 1s 9d to 42s 6d. E. K. Cole hardened a florin to 20s 6d. Many other advances—some of them considerable—are shown in the list of prices.

Tube Investments

Tube Investments final dividend, for the year ended last July, is expected within a few weeks, and interest is noticeably rising in anticipation of the event. At 64s the price of the £1 shares is the highest reached this year or last. Distributions for 1951–52 were together equivalent to 15 per cent on the present capital, as increased during the period by the share-for-share bonus, and were severely conservative in character. On that basis, the yield on the shares is only £4 8s 3d per cent, which indicates market confidence in next month's dividend decision. An interim of 7½ per cent has been paid this year.

Watford Bonus Shares

Bonus shares issued last month by Watford Electric and Manufacturing do not qualify for the recently declared interim dividend of 5 per cent, but will rank thereafter on all forms with the old. The 2s shares have been well supported, up to about 5s or a little over, since news of the bonus. The amount involved in paying last year's total ordinary distribution of 25 per cent would provide for a dividend of rather more than 15½ per cent on the capital as now increased. On that basis, the yield on the shares can be provisionally put at 6¼ per cent, pending the annual results due in the early part of next year.

Hackbridge Cable Meeting

Net taxed profits of Hackbridge Cable Holdings increased in the year ended last March from £87,000 to £157,000. Maintenance of the ordinary dividend at the same rate of 20 per cent as before leaves a surplus of about £100,000 to be added to the revenue reserves. These now amount to a total of £230,000, which compares with an issued ordinary capital of £450,000. These results were achieved in the face of a £155,000 increase in taxation charges at £246,000. After reviewing this satisfactory outcome at the recent meeting, the chairman expressed confidence in the further prospect, although, with buyers tending at present to minimize their orders, last year's figures may not be equal to the 1952–53 results. At 12s 9d the 5s shares show a yield of £7 17s per cent on a dividend covered three times by earnings.

Phoenix Telephone

The 5s shares of Phoenix Telephone & Electric Holdings, which published the annual accounts last week, are quoted officially at 6s 9d. For the year ended last February the company is again paying a 10 per cent dividend, the rate distributed since it was made public three years ago. Although payable this time on a larger capital, the dividend remains well within the available surplus, which shows another moderate increase, to £48,000, despite larger tax and other charges. According to the chairman's review, output in the current year to date has been above the previous level, and orders on hand assure full production for many months. The indicated yield on the shares is about 7½ per cent.

Preference Shares

Good industrial preference stocks have, of course, responded automatically to the rise in gilt-edged prices. With the yield on War Loan down to about 4⅛ per cent, the investor has difficulty now in getting better than 4¾ per cent on his money from the more popular preference issues. That is, for instance, approximately the return from the 6¼ per cent preference shares of the G.E.C. and English Electric, both offered at 27s 3d, and from B.I.C.C. "sixes" at 25s. Ferranti 5½ per cents at 22s 3d give nearly 5 per cent on the money, and Reliance Clifton 5 per cents at 19s 6d, a little more. Cossor "sixes" at 19s yield just over 6¼ per cent.

ELECTRICAL INVESTMENTS

Past Week's Price Changes

Company	Dividend Previous	Dividend Last	Middle Price 5th Oct. 1953	Week's Rise or Fall	Est. Yield p.c.
Gilt-edged and Overseas Stocks			£ s d		
Brit. Elec. 1968/73	3	3	89½	+½	3 7 0
Brit. Elec. 1974/77	3	3	88½	+½	3 7 10
Brit. Elec. 1976/79	3½	3½	94½	—	3 14 0
Brit. Elec. 1974/79	4½	4½	102	—	4 3 4
Calcutta Elec. ..	6†	6†	19/-	−1/-	6 6 4
East African Power	7	7	22/6xd	—	6 4 5
Nigerian Elec. ..	10	10	24/-	—	8 6 8
Palestine Elec. "A"	5†	Nil	17/6	+1/-	—
Perak Hydro-Elec.	Nil	Nil	16/6	—	Nil
Equipment and Manufacturing					
Aberdare Cables(5/-)	20	25	8/6	—	7 7 0*
Aerialite (1/-) ..	83½	88½	8/9	—	10 1 10
Allen, W. H. ..	15	15	46/-	—	6 10 5
Aron Elec. Ord. ..	15	20	42/6	—	9 8 2
Assoc. Elec. Ord.	20	20	82/6	+3/9	4 17 7
Automatic Tel. & El.	15	15	60/9	+9d	4 18 8
Babcock & Wilcox	18	18	71/3	+4/9	5 1 3
Baldwin, H. J. (2/-)	20	20	4/3xd	—	9 8 4
Bakelite (10/-) ..	—	12½	22/6	+3/-	5 11 3
British Aluminium	12	12	38/3xd	+1/9	6 6 0
B.I. Callender's ..	9	10	39/-	+1/-	5 2 7
British Thermostat (5/-)	30	35	17/6	—	—
British Vac. Cleaner (5/-)	25	25	13/3	—	9 8 8
Brook Motors (10/-)	20	20	38/9	—	5 3 3
Brush Ord. (5/-) ..	10	4	4/6	+6d	—
A. F. Bulgin (1/-)	30	30	3/-	—	10 0 0
Burco (5/-) ..	38½	35	18/9	—	9 6 8
Chloride El. Storage	15	20	80/-	+1/8	5 0 0
Cole, E. K. (5/-) ..	25	25*	20/6	+2/-	6 2 0
Cossor, A. C. (5/-)	Nil	10	8/-	−6d	6 5 0
Crabtree (10/-) ..	17½	17½	29/-	—	6 0 8
Crompton Parkinson Ord. (5/-) ..	11¼	11¼	12/9	+1/-	4 8 3
De La Rue (5/-) ..	35	Nil	9/-	−9d	—
Decca (5/-) ..	112½	150	31/9	—	4 14 6*
Dewhurst (2/-) ..	22½	19*	5/6	—	6 18 3
Dictograph Tel.(2/-)	20	20	5/6	—	—
E.M.I. (10/-) ..	12	12	14/3	+3d	8 9 0
Electrical Components (5/-) ..	20	20	9/6	−6d	10 10 6
Elec. Construction	15	15	53/9	+⅛	5 11 9
Enfield Cable Ord.	7½	5	21/3	—	4 14 0
English Electric ..	15	15	53/-	+⅛	5 9 1
Ericsson Tel. (5/-)	22†	22*†	42/6	+1/9	2 11 9†
Ever Ready (5/-)..	35	35	27/6	+6d	6 7 3
Falk Stadelmann	15	15	43/6	+3d	6 17 7
G.E.C. Ord. ..	22½	11½*	39/6	—	5 14 0
General Cables (5/-)	30	30	16/9	+6d	8 19 2
Greenwood & Batley	15	17½	40/9	—	8 11 9
Hackbridge Cable (5/-)	20	20	12/9	—	7 17 0
Hackbridge Hewittic (5/-)	20	20	17/6	—	5 14 2
Hall Tel. Acc.(10/-)	10	10	10/-	—	10 0 0
Hentrae (2/-) ..	12½	12½	4/-	—	6 5 0
Henleys (10/-) ..	20	10½*	17/3xd	+6d	6 1 9
Holophane (5/-) ..	15	20*	12/6	—	8 0 0
Hoover (5/-) ..	35	25	26/3	+6d	4 15 3

Company	Dividend Previous	Dividend Last	Middle Price 5th Oct. 1953	Week's Rise or Fall	Est. Yield p.c.
Equipment and Manufacturing (continued)			£ s d		
Intl. Combustion (5/-)	25	15*	14/3	—	5 5 3
Johnson & Phillips	15	15	52/6	+6d	5 14 3
Lancashire Dynamo	12½	12½	43/9	—	5 14 3
Laurence, Scott (5/-)	15	15	13/3	+6d	5 13 2
London Elec. Wire	12½	15	68/3	+4/6	4 8 3
J. Lucas	7½	9½	46/3	+3/3	4 2 3
Marryat & S. (2/-)	22½	22½	5/9	—	7 16 6
Mather & Platt ..	12½	15	51/6	—	5 16 6
Metal Industries ..	15	12*	41/-	+6d	5 17 1
Mid. Elec. Mfg. ..	15	15	60/-	—	5 0 0
Murex	15	15	53/6	−6d	5 12 2
Newman Ind. (2/-)	10	10	2/3	—	8 17 9
Oldham & Son (1/-)	35	17½*	2/6	—	7 0 0
Parnall (Yate) (5/-)	6	6	3/4½	+1½d	8 17 10
Parsons, C. A. ..	10*	12½	76/6	+4/-	3 5 6
Plessey (5/-) ..	22½	25	28/3	—	4 8 6
Pye Deferred (5/-)	18	20	19/6	+3d	5 2 6
Revo (10/-) ..	27½	27½	16/3	—	—
Reyrolle	10*	12½	70/-	+5/-	3 11 5
Scot. Cable (4/-) ..	32	20*	13/-	—	6 3 0
Siemens Ord. ..	10	10	35/-	—	5 14 4
Southern Areas ..	5	6	17/6	—	6 17 3
Strand Elec.(5/-)..	17½	17½	8/3	—	10 12 2
Sturtevant (5/-) ..	17½†	18·1*†	28/-xd	—	3 4 6†
Sun Elec.	15	15	25/-	—	12 0 0
Switchgear & Cowans (5/-)	22½	22½	14/-	—	8 0 9
Taylor, T. (5/-) ..	20	25	20/-	—	6 5 0
T.C.C. (10/-) ..	20	20*	40/-xd	—	—
T.C. & M. ..	10	8½*	28/6	—	5 19 1
Telephone Mfg. (5/-)	10	10	7/6	—	6 13 4
Thorn. Elec. (5/-)	10	12½	11/3	+3d	5 11 1
Tube Investments	25	15*	64/-	+2/-	4 8 3
Vactric (5/-) ..	Nil	Nil	7/6	—	—
Veritys (5/-) ..	7½	10	4/6	—	11 2 2
Walsall Conduits (4/-)	70	70*	44/6	—	6 5 10
Ward & Goldstone (5/-)	45	45*	39/-	—	5 15 9
Watford (2/-) ..	25	25	5/3xd	—	—
Westinghouse Brake	14	15	57/6	—	5 4 2
West, Allen (5/-) ..	15	15	12/6	+3d	6 0 0
Trusts, Transport and Communications					
Anglo-Am. Tel.: A Ord. ..	—	6	85½	—	7 0 4
Ord.	—	3½	57½	—	6 10 5
Anglo-Portuguese	8	8	22/3	—	7 3 9
Brit. Elec. Traction: Def. Ord. (5/-) ..	25	35	31/-	+6d	5 13 0
Cable & Wireless: Ord.	8	8	137½	+3	5 16 5
4% Loan ..	4	4	97	—	4 2 6
Calcutta Trams ..	6†	6†	19/-	−6d	6 6 4†
Cape Elec. Trams	5	5½	10/-	—	11 0 0
Marconi Marine ..	10	10	27/6	—	7 5 6
Oriental Tel. Ord.	16	16	71/3	+⅛	—
Telephone Props.	8	8	5½	—	—
Tele. Rentals (5/-)	10	10*	9/3	—	5 8 1

* After capital bonus. † Dividends are paid free of income tax.

The above quotations are based upon the middle prices given in the Stock Exchange Daily Official List.

REPORTS and DIVIDENDS

Stothert & Pitt, Ltd.—The accounts for the year to 30th June last show profits, before taxation, of £548,152, an increase of £110,844 as compared with the preceding year, and after charging £251,301 for taxation, the net balance is £296,851 (against £230,230). It is proposed to place £100,000 to re-equipment reserve and £100,000 to general reserve. The proposed final ordinary dividend is 12½ per cent (against 10 per cent), making 17½ per cent for the year (15 per cent), and the balance carried forward is £103,604 (£88,897 brought in).

Application has been made to the Capital Issues Committee for permission to capitalize reserves in order to make a proposed scrip issue of five ordinary shares for every eight held. A further announcement in this connection will be made in due course.

Scottish Cables (South Africa), Ltd., reports a trading profit for the year ended 30th June last of £373,562, as compared with £195,517 for the preceding year. Taxation absorbs £111,983, and after adding £15,236 brought in, the balance available is £244,924. It is proposed to pay a dividend for the year of 12½ per cent (against 7½ per cent), and to place £110,000 to general reserve, leaving a balance of £59,924 to be carried forward.

Babcock & Wilcox, Ltd., are making a public issue of £4,000,000 of debentures, and a scrip issue of ordinary shares. The debenture stock will be a 4¼ per cent stock, redeemable 1980, and will be offered at £97½ per cent. The subscription list was to open and close yesterday (Thursday). The proposed scrip issue will capitalize £2,508,133 of reserves, and ordinary stockholders will be given one new £1 ordinary share for every £2 stock held.

An interim dividend of 7½ per cent (unchanged) has been declared. This dividend does not apply to the scrip issue mentioned above.

The Sturtevant Engineering Co., Ltd.—In our last issue we stated that the interim dividend declared of 5½ per cent was unchanged. Actually this is an increase of ¼ per cent on last year's interim of 5¼ per cent.

Brook Motors, Ltd., announces that at an extraordinary general meeting held on 29th September the capitalization of reserves was approved.

The Superheater Co., Ltd., has announced an interim dividend of 6d per share (same).

New Companies

Wilkinson Processss (High Frequenc?), Ltd.—Registered 29th September. Capital £100. To apply for or acquire any trade secrets, processes, inventions, etc., and to carry on the business of mechanical, electrical, constructional, scientific engineers, etc. Regd. office : Grand Buildings, Trafalgar Square, W.C.2.

K. P. Wood, Ltd.—Registered 21st September. Capital £1,000. Manufacturers, manufacturers' agents, wholesale and retail dealers in and importers and exporters of and general agents for electrical submersible, centrifugal and other pumps, etc. Directors : K. P. Wood and Noreen M. Wood. Regd. office : 71, Temple Row, Birmingham, 2.

W. & F. Hallam & Co., Ltd.—Registered 25th September. Capital £3,500. Electrical engineers and contractors, radio engineers, etc. Directors : W. Hallam and F. R. Hallam. Regd. office : 139, Lee Road, Blackheath, S.E.3.

Tele-Rent (Eastbourne), Ltd.—Registered 26th September. Capital £1,000. Manufacturers, sellers, importers, exporters, repairers and letters on hire, of wireless and television transmitting and receiving sets, etc. Directors : F. Wood and A. V. W. Davis. Regd. office : 4, St. James's Street, S.W.1.

Increases of Capital

Electricals, Ltd.—Increased by £15,000, in £1 ordinary shares, beyond the registered capital of £10,000.

Liquidations

Gordon Hughes Electrical Co., Ltd.—With reference to the notice published in our issue of 25th September relating to this company, we are asked to state that the notice refers to the old company, which, owing to the death of Mr. Gordon Hughes, has been reorganized and a new company formed with the same title with Mr. J. P. Long, a director of the old company, as managing director.

Bankruptcies

N. W. Doidge and **J. C. Stephenson**, formerly carrying on business in partnership as Doidge & Stephenson, 16, Coldwell Street, Felling, Co. Durham, electrical contractors.—Trustee, Mr. R. F. Howe, Clarendon House, Clayton Street West, Newcastle-upon-Tyne, 1, Official Receiver, released 24th September.

J. R. Short, formerly carrying on business at 11, Rutland Avenue, Bishop Auckland, electrical contractor.—Trustee, Mr. R. F. Howe, Clayton Street West, Newcastle-upon-Tyne, Official Receiver, released 29th September.

Arc Welding

Inaugural Address to the I.E.E. North Western Centre

THIS year's inaugural address of the chairman of the North Western Centre of the Institution of Electrical Engineers was delivered by Mr. H. West (M.V.E. Co., Ltd.) on 6th October. Its subject was "The Electric Arc and the Welding Engineer." He pointed out that, with the low-voltage high-current discharge used for arc welding, refractory electrodes (e.g., carbon and tungsten) could reach a high enough temperature to enable all the electrons required for current flow to leave the cathode by thermionic emission. Very large welding currents, however, required an extremely high emission of electrons, which probably could not be supplied by thermionic emission alone. The presence of certain metals or their oxides facilitated emission. The anode, on the other hand, was heated by energy derived from the electrons which reached it after acceleration by the anode drop. The anode drop, and hence the total energy received, depended largely upon arc atmosphere and anode metal. More energy was released at the anode than at the cathode.

Composition of Arc Column

The arc column consisted of a high temperature core which carried most of the current, and an outer envelope or plasma which was a region of chemical activity. Most of the energy of the column was radiated outwards, the cathode and the anode both receiving a share. The greater heat produced by long arcs was largely dissipated, the effective heat at the cathode and anode being the result of electronic processes at their surfaces. The resistance coefficient of the arc was negative, i.e. with increasing current the potential drop across the arc decreased; with large currents the voltage varied little with current.

In early days when 150 to 250 A were normally required, d.c. was practically always used to facilitate the maintenance of a stable arc, but as currents increased to upwards of 450 A the handling of large gauge electrodes proved fatiguing and magnetic effects were evident so that a.c. welding became essential, added to which was the greater convenience of transformers and reactors as compared with heavy rotating machines.

Effect of Impurities

With a.c. the arc was extinguished at each half cycle, but the temperature of the electrode tip fell slowly so the arc would restrike. At zero current the arc voltage rose rapidly to the peak necessary to break down the arc gap and then remained substantially constant until reversal for the negative half cycle. Impurities which increased thermionic emission from the cathode provided the explanation of why some rods would weld on a.c. or d.c. and others on d.c. only.

After discussing the mechanism of the transfer of the electrode metal to the work, Mr. West considered welding (as a casting technique) of non-ferrous metals with especial reference to aluminium and to the formation of arcs in varicus gases. The limitations of hydrogen and nitrogen were described. Helium as a protective atmosphere was very satisfactory but occurred in quantity only in the U.S.A. Argon-arc welding promised good results.

Aluminium Arc Behaviour

Electrically the aluminium arc tended to behave as a rectifier with high back voltage, a d.c. component appearing with the a.c. having an undesirable effect on the welding transformer. Inserting a capacitor between the secondary winding and the arc increased the voltage during the half cycle thus tending to equalize the current loops.

Among other solutions referred to was one developed by E.R.A. in which an impulse generator injected a single pulse of 300 V into the arc at the start of the half cycle when the aluminium was becoming the cathode, enabling welding to be carried out at 50 V on open circuit.

NEXT WEEK'S EVENTS

Monday, 12th October

BIRMINGHAM.—Imperial Hotel, 6 p.m. I.E.E. South Midland Supply and Utilization Group. "Electricity in Farm Crop-Drying," by C. A. Cameron Brown and P. G. Finn-Kelcey.

CARDIFF.—At the South Wales Institute of Engineers, Park Place, 6 p.m. I.E.E. Western Centre. Chairman's address by J. Vaughan Harries.

DUNDEE.—Mathers Hotel, 7.30 p.m. Incorporated Plant Engineers, Dundee Branch. "Factory Instrumentation."

LEICESTER.—Electricity Offices, Charles Street, 7 p.m. Leicester Electrical Society. "Diagnostic Use of Electricity in Medicine," by Dr. N. R. W. Simpson.

LONDON.—St. Ermin's Hotel, Caxton Street, S.W.1, 7 p.m. A.S.E.E. Central London Branch. "Electrical Aspects in Water Engines."

At the Royal Society of Arts, John Adam Street, 6.45 p.m. Purchasing Officers' Association, London Branch. "The Commercial Relationship between Great Britain and the Commonwealth of Australia," by the Australian Government Senior Trade Commissioner.

MANCHESTER.—Engineers' Club, Albert Square. Junior Institution of Engineers, North Western Section. Annual general meeting and presidential address.

Grand Hotel, 6.45 p.m. Institution of Works Managers, Manchester Branch. "Man Management," by S. Waugh.

NEWCASTLE-ON-TYNE.—Neville Hall, Westgate Road, 6.15 p.m. I.E.E. North-Eastern Centre. Chairman's address by H. Esther.

NORWICH.—Royal Hotel, 7.30 p.m. I.E.E. Norwich District Meeting. "Design Features of Certain British Power Stations," by S. D. Whetman and A. E. Powell.

SHEFFIELD.—The University, Western Bank, 6.30 p.m. I.E.S. Sheffield Centre. Chairman's address by J. Dean.

Livesey Clegg House, 7.30 p.m. Junior Institution of Engineers, Sheffield and District Section. Annual general meeting and chairman's address, "Sheet and Tinplate—an Industrial Revolution," by J. S. Mayne.

Monday, 12th October, to Friday, 16th October

LONDON.—Seymour Hall, W.1. London Nursing Exhibition.

Tuesday, 13th October

BELFAST.—Presbyterian Hostel, Howard Street, 6.15 p.m. I.E.E. Northern Ireland Centre. Chairman's address by J. R. W. Murland.

BIRMINGHAM.—Grand Hotel, 7 p.m. Institution of Works Managers, Birmingham Branch. "Training for Management—the Line of Succession," by C. D. Law.

CAMBRIDGE.—Technical College, 6 p.m. I.E.E. Cambridge Radio Group. Chairman's address by D. Weighton.

CHELTENHAM.—Purchasing Officers' Association, Gloucestershire Branch, 7.30 p.m. "Electrical Instruments."

KENTON.—Rest Hotel, Kenton Lane, 8.15 p.m. A.S.E.E. North West London Branch. "Jet Engines," by A. C. Parkes.

LEEDS.—1, Whitehall Road, 6.30 p.m. I.E.E. North Midland Centre, Education Discussion Circle. "Technical College Examinations," opened by R. A. H. Sutcliffe.

LIVERPOOL.—Adelphi Hotel, 6.30 p.m. Institution of Works Managers, Merseyside Branch. Lecture and film on "Mechanical Handling," by L. Landon Goodman.

LONDON.—The Institution, 6 p.m. I.E.E. Education Discussion Circle. Discussion on "How Should the Action of Polyphase Commutator Motor be Approached?" opened by I. L. Stefani.

At the Royal Institution, Albemarle Street, 6 p.m. Illuminating Engineering Society. Presidential Address, by W. R. Stevens.

85, Minories, E.C.3, 5.30 p.m. Institute of Marine Engineers. "Operation of a Gas Turbine under Sea Conditions," by J. Lamb and R. M. Duggan.

Charing Cross Hotel, W.C.2. Institute of Metal Finishing. Autumn meeting and annual dinner.

MALVERN.—Winter Gardens Restaurant, 7.15 p.m. I.E.E. South Midland Centre. District Meeting. "The Development of Electrical Aids to Anti-Aircraft Gunnery," by D. H. A. Huddart.

MANCHESTER.—Engineers' Club, Albert Square, 6.15 p.m. I.E.E. North-Western Utilization Group. "Fluorescent Discharge-Tube Circuits and Operating Problems," by J. Cates. (Joint meeting with the Manchester Branch of the I.E.S.).

Engineers' Club, Albert Square, 7.15 p.m. Incorporated Plant Engineers, Manchester Branch. "The Plant Maintenance Team's visit to the U.S.A.," by C. Troup.

NEWPORT.—Tredegar Arms Hotel, 7.0 p.m. Newport and District Electric Club. "Building Britain's Grid," "Crossing the Usk" and "Erection of Sutton Coldfield Television Mast," colour and sound films.

PRESTON.—Victoria and Station Hotel. Institution of Works Managers, Preston Branch. Dinner and meeting: "Discussion on some Case Studies."

RUGBY.—College of Technology and Arts, 6.30 p.m. I.E.E. Rugby Sub-Centre, Students' Section. Chairman's Address, "New Ferromagnetic Materials and their Uses," by D. J. Storey.

STOKE-ON-TRENT.—31, Kingsway, 6 p.m. I.E.S. Stoke-on-Trent Group. "Application of Flash Discharge Tubes." (Joint meeting with the North Staffordshire Photographic Society.)

Tuesday, 13th October, to Thursday, 15th October

LONDON.—Royal Horticultural (New) Hall. Engineering Industries Association. London regional Display.

Wednesday, 14th October

BIRMINGHAM.—James Watt Institute, 6.45 p.m. I.E.E. South Midland Centre, Students' Section. Chairman's Address, "The Distribution of Electricity," by G. S. Johns.

BRADFORD.—Midland Hotel, 7.30 p.m. A.S.E.E. Bradford Branch. "Application of Electricity to Oil Refining," by S. York.

DARLINGTON.—I.E.E. Tees-Side Sub-Centre. Visit to Patons & Baldwins Works, Darlington.

HOVE.—S.E.E.B. Headquarters, 6.30 p.m. I.E.E. Southern Centre. "The Testing and Specification of Bushings in relation to Service Conditions," by H. Barker and H. Davies.

HUDDERSFIELD.—Y.E.B., Market Street, 7.30 p.m. I.E.S. Huddersfield Group. "The Use of Light in Horticulture," by J. J. French.

LONDON.—Savoy Place, W.C.2, 5.30 p.m. I.E.E. Radio Section. Chairman's address by J. A. Smale.

2, Savoy Hill, W.C.2, 6 p.m. Royal Statistical Society, Study Section. "Some Problems in Questioning, illustrated by a recent inquiry about the Third Programme," by B. Emmett.

NEWCASTLE-ON-TYNE.—At the Institution of Mining and Mechanical Engineers, 6 p.m. British Institution of Radio Engineers, North Eastern Section. "The Impact of Communication Theory on Television," by Dr. D. A. Bell.

NOTTINGHAM.—Gas Board Showrooms, Parliament Street, 7 p.m. Incorporated Plant Engineers, East Midlands Branch. "The Works Engineer and the Factories Act."

YORK.—City Hotel, Lendal, 7.30 p.m. A.S.E.E. York Branch. "The Diesel Generator."

Wednesday, 14th October, to Saturday, 24th October

MANCHESTER.—Belle Vue. International Textile Machinery and Accessories Exhibition.

(*Continued at foot of page* 821)

NEW PATENTS

Electrical Specifications Recently Published

The numbers under which the specifications will be printed and abridged are given in parentheses. Copies of any specification (2s 8d each including postage) will be obtainable after 18th November from the Patent Office, 25, Southampton Buildings, London, W.C.2.

1948

33618. Postmaster General. Telecommunication exchange systems. 7th March, 1950. (699901.)

1949

10042. General Electric Co., Ltd., and Nelson, E. H.—Electric circuit arrangements for operating high pressure vapour-electric discharge lamps. 13th April, 1950. (699791.)

10347. Philips Electrical, Ltd.—Devices for feeding tapes. 19th April, 1949. (699903.)

15797. McSorley, D. J., Robins, J. T., Behar, D., and Tarbat, Viscount.—Systems for detecting movements of objects by their effect on the electrostatic capacity of a conductor. 14th September, 1950. (699853.)

17492. Etessam, A. H.—Gas-turbine and jet propulsion power plants. 14th August, 1950. (699854.)

27584. Pye, Ltd., and Theile, R.—Television apparatus. 27th October, 1950. (699905.)

1950

306. Landauer, P. M.—Connector device for use with electric cable or flex. 5th April, 1951. (699856.)

5788. Marconi's Wireless Telegraph Co., Ltd.—Television systems. 3rd November, 1950. (699795.)

7468. Parsons & Marine Engineering Turbine Research & Development Association.—Detection of cracks in engineering components. 21st March, 1951. (699796.)

10994. Electric & Musical Industries, Ltd.—Cathode-ray tubes. 20th April, 1951. (699739.)

11018. Foster Transformers & Switchgear, Ltd., and Jennings, R. E.—Constant voltage supply systems. 3rd May, 1951. (699740.)

11757. Weir, Ltd., G. & J., and Hillier, H.—Closed feed systems for steam power plants. 11th May, 1950. (699797.)

11988. Electric & Musical Industries, Ltd.—Circuits for establishing the d.c. component in electrical signals. 11th May, 1951. (699798.)

14908. Cope, Whelon & Co., Ltd.—Thermostatic control devices, particularly for brooders. 6th September, 1951. (699742.)

15309. Broida, V.—Electrically operated, fluid actuated mechanism for controlling the magnitude of a quantity. 19th June, 1950. (699803.)

23569. British Thomson-Houston Co., Ltd.—Magneto-responsive devices. 26th September, 1950. (699746.)

24237. Commonwealth Scientific & Industrial Research Organization.—Electronic counting device. 4th October, 1950. (699863.)

24683. Cannon Industries, Ltd., and Oatley, A. F.—Electric-grilling appliances. 2nd October, 1951. (699960.)

24722. British Thomson-Houston Co., Ltd., and Rayner, F. J. H.—Safety guards for power presses. 8th October, 1951. (699810.)

27083. Allen, Sons & Co., Ltd., W. H., Smith, F. S., and Pope, A. W.—Gas-turbines. 6th November, 1951. (699865.)

28186. General Electric Co., Ltd., and Irving, H. D.—Apparatus for controlling the speed of a movable member. 16th November, 1951. (699811.)

30367. Sylvania Electric Products, Inc.—Electronic valve. 12th December, 1950. (699751.)

1951

1352. Electric & Musical Industries, Ltd.—Electric immersion heaters. 16th January, 1952. (699915.)

3718. Metropolitan-Vickers Electrical Co., Ltd.—Magnetic electron lenses. 11th January, 1952. (699830.)

5255. Research Corporation.—Electrical precipitators. 5th March, 1951. (699867.)

5328. Cory Corporation.—Housing forming an enclosure for an electric fan or electric heater. 5th March, 1951. (699919.)

7154. General Electric Co., Ltd.—Apparatus including a photo-electric cell. 28th March, 1952. (699922.)

7549. Ellison, Ltd., G.—Tank constructions for air-break electric circuit-breakers. 28th March, 1952. (699763.)

7710. General Electric Co., Ltd., and Bryden, J. E.—Apparatus for indicating phase relationship between electrical quantities. 26th March, 1952. (699832.)

8278. Sperry Products, Inc.—Variable angle electric-acoustic transducers. 10th April, 1951. (699764.)

8436. Telephone Manufacturing Co., Ltd.—Carrier-wave telephone or like systems. 2nd April, 1952. (699765.)

9604. Bulpitt & Sons, Ltd.—Coupling units for electrically heated vessels and utensils. 8th July, 1952. (699870.)

10393. Mullard Radio Valve Co., Ltd.—Thermionic cathodes. 15th February, 1952. (699977.)

12451. Pye, Ltd.—Arrangement for remotely controlling the gain of an electronic amplifier. 28th May, 1952. (699771.)

Next Week's Events *(continued)*

Thursday, 15th October

BLACKBURN.—Grosvenor Hotel, Lord Street, 7.30 p.m. Incorporated Plant Engineers, Blackburn Branch. "Gunite in Industrial Building Maintenance," by G. N. Ternan.

CHELTENHAM.—Belle Vue Hotel. I.E.S. Gloucester and Cheltenham Centre. Annual dinner.

DUBLIN.—Trinity College, 6 p.m. I.E.E. Irish Branch. Chairman's address by Prof. J. J. Morrissey.

HULL.—Y.E.B. Ferensway, 7.15 p.m. I.E.E. North Midland Centre. Chairman's address by G. Caton.

LONDON.—Dorchester Hotel, Park Lane, W.1, 7 p.m. for 7.30 p.m. Institution of Mechanical Engineers. Annual dinner.

PLYMOUTH.—Grand Hotel, 3 p.m. I.E.E. South Western Sub-Centre. Chairman's address by J. E. Flower.

Friday, 16th October

BIRMINGHAM.—Grand Hotel, 7 p.m. for 7.30 p.m. Birmingham Electrical Club. Ladies' evening. Dinner-dance.

LONDON.—Storey's Gate, St. James's Park, S.W.1, 5.30 p.m. Institution of Mechanical Engineers. Presidential address by A. Roebuck.

MANCHESTER.—Engineers' Club, Albert Square, 6.45 p.m. Manchester Association of Engineers. "The Formation and Prevention of Atmospheric Contamination in Factories," by W. A. Attwood and W. B. Lawrie.

Saturday, 17th October

HUDDERSFIELD.—Y.E.B., Market Street, 2.30 p.m. I.E.E. North Midland Students' Section. "A.C. Voltage Stabilizers," by M. S. Seaman.

16371. Owens-Corning Fiberglas Corporation.—Separators for storage battery plates. 10th July, 1951. (699981.)

20339. Siemens Bros. & Co., Ltd.—Telephone systems. 29th August, 1952. (699986.)

20861. British Thomson-Houston Co., Ltd.—Dynamo-electric machines. 4th September, 1951. (699987.)

25051. Eppler, J., and Barok, A.—Telephone amplifiers. 26th October, 1951. (699883.)

25604. Merles, A. J.—Checking or monitoring equipment for radio receivers and transmitters. 1st November, 1951. (699993.)

25686. Brush Development Co.—Magnetic transducer head and method of making same. 2nd November, 1951. (699885.)

25990. Wallauschek, R.—Non-selective attenuators employed for ultra-high frequencies, matched on both sides with coaxial lines. 6th November, 1951. (699992.)

26046. Allmanna Svenska Elektriska Aktiebolaget.—Device for measuring direct currents. 7th November, 1951. (699783.)

27151. Fontaine, J. G., and McLean, A. D.—Telephone answering and recording devices. 20th November, 1951. (699785.)

28023. Philips Electrical Industries, Ltd.—Apparatus for supplying ringing current in automatic telephone-exchange and like systems. 29th November, 1951. (699941.)

29875. British Thomson-Houston Co., Ltd.—Signal discriminators. 20th December, 1951. (699995.)

1952

37. Philips Electrical Industries, Ltd.—Radio pulse-transmitters. 1st January, 1952. (699942.)

2417. Union Carbide & Carbon Corporation.—Self-induced magnetic field controlled gas-shielded-arc welding process and apparatus. 29th January, 1952. (699944.)

2881. Westinghouse Electric International Co.—Radar and like apparatus. 4th February, 1952. (699998.)

2916. British Thomson-Houston Co., Ltd.—Clothes dryers. 4th February, 1952. (699945.)

3842. Radio Corporation of America.—Gating arrangements for time division multiplex signalling systems. 13th February, 1952. (699889.)

5805. Compagnie Générale de Télégraphie sans Fil.—Interdigital delay lines for travelling wave-tubes. 5th March, 1952. (699890.)

6180. Eldorado Mining & Refining (1944), Ltd.—Beam therapy apparatus. 10th March, 1952. (699845.)

6246. Bouix, M.—Rotary joints for electromagnetic waveguides on radar systems. 11th March, 1952. (699891.)

6577. Philips Electrical Industries, Ltd.—Circuit-arrangement for use in a television receiver. 13th March, 1952. (699999.)

6581. Gialluly, E. M. S. de.—Variable condensers. 13th March, 1952. (699790.)

8133. British Thomson-Houston Co., Ltd.—Luminescent materials. 31st March, 1952. (699847.)

8569. Compagnie Générale de Télégraphie sans Fil.—Ultra-high-frequency travelling wave oscillators. 3rd April, 1952. (699893.)

11115. Fernseh Ges.—Television camera apparatus. 2nd May, 1952. (699895.)

TRADE MARKS

APPLICATIONS have been made for the registration of the following trade marks. Objections may be entered up to the dates stated:—

16th October

TECHNALLOY. No. 715,532, Class 9. Electric resistance material of metal alloys in the form of wire, tape or ribbon; electric resistances of metal alloy, and electric control apparatus employing such resistances.—Techna (Great Britain), Ltd., 47, Whitehall, London, S.W.1.

HYLENE. No. 717,956, Class 9. Switches, switchgear, fusegear, plug and socket connectors, contact devices, distribution boards, distribution boxes, terminals (metal), and parts and fittings included in Class 9.—C. H. Parsons, Ltd., Britannia Works, Wharfdale Road, Tyseley, Birmingham, 11.

ELECTRIX. No. B718,163, Class 9. Electrically-driven floor polishing machines.—Electrix, Ltd., Sterling Works, Dagenham, Essex.

DEXRAY. No. 718,269, Class 9. Electrical apparatus and instruments included in Class 9; radio and television apparatus and instruments; and parts included in Class 9 of all these goods.—Dexray Engineering Co., Ltd., Dexray Works, Brock Street, Lees Street, Manchester, 1.

TELELUX. No. 720,240, Class 9. Radio sets, television sets and combined radio and television sets.—Alfred Silver, 65, Medfield Street, London, S.W.15.

CONOVOX. No. 720,292, Class 9. Electric and electronic apparatus and instruments, all included in Class 9; radio, television, telephonic and signalling apparatus and instruments; sound recording, sound reproducing and sound transmitting apparatus and instruments and parts included in Class 9 of all the aforesaid goods; and gramophone needles, gramophone records, and phonograph rolls.—George Kingsley, trading as Dictating Machine Co., 32, Victoria Street, London, S.W.1.

PETCAP. No. 720,706, Class 9. Electric condensers.—Dubilier Condenser Co. (1925), Ltd., Ducon Works, Victoria Road, North Acton, London, W.3.

WEATHERMASTER. No. B708,989, Class 11. Air conditioning and ventilating installations.—Carrier Engineering Co., Ltd., 24, Buckingham Gate, London, S.W.1.

MORTRON. No. 717,442, Class 11. Electrical air-conditioning and air-purifying appliances, being vaporizers; and electrically actuated devices for destroying insects, germs and bacteria by fumigation.—Société Anonyme Mortron pour l'Europe, Bienne, Switzerland. Address for service c/o Marks & Clerk, 57-58 Lincoln's Inn Fields, W.C.2.

HOLO. No. 720,025, Class 11. Installations for lighting and parts included in Class 11.—Holophane, Ltd., Holophane House, Elverton Street, Vincent Square, London, S.W.1.

CREDA CONTOUR. No. 720,414, Class 11. All goods included in Class 11.—Simplex Electric Co., Ltd., Broadwell, Oldbury, nr. Birmingham.

MULTI. No. 715,990, Class 17. Electrical insulation material.—Karl Felix Mayer, 1-3, Redhill Street, N.W.1.

23rd October

KB (design). No. 705,311, Class 9. Radio, television and sound recording and reproducing apparatus.—Kolster Brandes, Ltd., Cray Works, Sidcup, Kent.

SCRUIT. No. 707,413, Class 9. Electrical connectors.—V.G. Porcelain Co., Ltd., Gorst Road, Park Royal, London, N.W.10.

DRIMAC. No. 714,777, Class 9. Instruments and apparatus for recording, measuring or controlling, by electric current, the operations of industrial processes.—Elliott Brothers (London), Ltd., Century Works, Lewisham, London, S.E.13.

ASTRAL (design). No. 713,398, Class 9. Electrical switchgear and electrical apparatus for use in operating machines, engines and motors by current control.—Astral Switchgear, Ltd., Alma Road, Ponders End, Middx.

No. 717,695 (design), Class 9. Electric cells, batteries, and parts of and fittings included in Class 9 for these goods.—Compagnie Industrielle des Piles Electriques (C.I.P.E.L.), Neuilly-sur-Seine, France. Address for service, c/o D. Young & Co., 29, Southampton Buildings, W.C.2.

COLOTRON. No. 718,703, Class 9. Television apparatus and parts therefor included in Class 9; and cathode ray tubes.—Pye, Ltd., Radio Works, St. Andrews Road, Cambridge.

SQUIRREL. No. 716,555, Class 9. Parts included in Class 9 of electrical apparatus and instruments, all being made principally of moulded non-metallic materials.—C. H. Parsons, Ltd., Britannia Works, Wharfedale Road, Tyseley, Birmingham, 11.

ULTRAPAS. No. 718,978, Class 17. Electric insulating materials; and non-mouldable plastics in the form of plates, tubes and rods.—Dynamit-Actien-Gesellschaft Vormals Alfred Nobel & Co., Troisdorf, near Cologne, Germany. Address for service, c/o Haseltine, Lake & Co., 28, Southampton Buildings, Chancery Lane, London, W.C.2.

CONTRACT INFORMATION

Accepted Tenders and Prospective Electrical Work

CONTRACTS OPEN

Where "Contracts Open" are advertised in our "Official Notices" section the date of the issue is given in parentheses.

Aberdare.—19th October. U.D.C. Street lighting equipment. (See this issue.)

Belfast.—20th November. 33 kV, 6·6 kV and auxiliary cables. (See this issue.)

Bournemouth.—12th November. Corporation. Electrical installation at Kinson sewage disposal works extension. (See this issue.)

Chile.—VALPARAISO.—22nd October. Servicio de Exploitasion de Puertos. Two 300 kW mercury vapour rectifiers, and electrical equipment for 600 kVA transformer substations at Antofagasta and Coquimbo. (E.S.B. 5243/53. Ten/7217.)*

Coldstream.—17th October. Town Council. Electrical installations in 27 houses in Home Place. Town Clerk.

Dorchester.—Herrison Hospital Management Committee. Automatic telephone system. (See this issue).

Durham.—County Council. Electrical installation at City Technical College. (See this issue.)

Edinburgh.—North of Scotland Hydro-Electric Board. Distribution lines in Strathnairn and Strathspey, and in the County of Moray. (See this issue.)

Formosa.—TAIPEI.—16th November. Central Trust of China. Cold storage plant. (E.S.B. 5389/53. Ten/7249.)*

Glasgow.—30th October. Corporation. P.v.c. cable. (See this issue.)

India.—BOMBAY.—19th November. Bombay Electric Supply and Transport Undertaking. 22 kV and 6·6 kV switchgear and accessories. (E.S.B. 5384/53. Ten/7248.)*

Iraq.—BAGDAD.—31st October. One 250 kW diesel-electric generating set. (E.S.B. 5318/53. Ten/7226.)* 22nd October. Submarine cables and cable boxes. (E.S.B. 5316/53. Ten/7235.)*

Manchester.—21st October. City Council. Street lighting conversion boxes. (See this issue.)

New Windsor.—7th November. Borough Council. Electric lamps, fittings and cable for one year to 31st December, 1954. Borough surveyor, Kipling Memorial Building, Alma Road.

New Zealand.—WELLINGTON.—18th November. Post and Telegraph Department. Capacitors. (E.S.B. 5549/53. Ten/7255.)* Switchboard wire and cable. (E.S.B. 4926/53. Ten/7197.)*

Northern Ireland.—16th October. Fire Authority. Electrical work at the new fire stations under construction in Castle Street, Antrim, and Church Street, Portaferry. H. B. Reid, secretary, 43, Castle Street, Lisburn.

*Specifications may be inspected at the Export Services Branch, Board of Trade, Lacon House, Theobald's Road, London, W.C.1 (Chancery 4411; extension 769).

Pakistan.—KARACHI.—19th October. Department of Supply and Development. Fourteen electrically driven centrifugal water pumps, etc. (E.S.B. 5303/53. Ten/7244.)*

Romford. — 19th October. Corporation. Street lighting equipment. (See this issue.)

Spain. — MADRID. — 15th October. General Directorate of Railways, Tramways and Road Transport. Rolling stock and other narrow gauge railway equipment, including diesel motor coaches, diesel locomotives, electric motor coaches and motor coaches for goods traffic. (E.S.B. 4995/53. Ten/7228.)*

Sunderland.—21st October. Borough Council. Disintegrator plants for Grangetown and Castletown outfall sewers, each to consist of three pumps complete with motors and starters, electro-magnetic control gear, etc. Borough surveyor, 27, Fawcett Street.

Tettenhall.—14th October. U.D.C. Street lighting equipment. (See this issue.)

Thailand.—BANGKOK.—12th November. State Railways. Telephone line material. (E.S.B. 4950/53. Ten/7205.)*

United States.—SEATTLE.—2nd December. Corps of Engineers. One 3,000 kVA 3-phase transformer with accessories and spare parts.

WASHINGTON.—27th October. U.S. Army Corps of Engineers. Two 73,684 kVA a.c. generators for McNary Dam power station. (E.S.B. 5411/53. Ten/7240.)*

Wanstead and Woodford.—23rd October. Corporation. Street lighting equipment. (See this issue.)

West Riding.—26th October. County Council. Rewiring of Wombwell Secondary Modern School. (See this issue.)

ORDERS PLACED

Glasgow.—Transport Committee. Rectifier plant for Coplawhill substation (£81,314).—General Electric Co., Ltd.

London. — LEWISHAM. — Housing (Building) Committee. Two hundred semi-flush consumers' control units (£1,175).—Mantel Metalworkers, Ltd.

Newcastle-on-Tyne. — Education Committee. Installation of electric lighting and power at the new Stocksfield Avenue Primary School (£5,072).—Electra (Birmingham), Ltd.

Southampton.—Corporation. Recommended. Erection and wiring of concrete columns for lighting schemes 9 and 10 at Bassett Avenue, Winchester Road, part of Burgess Road, and Romsey Road (£1,216).—General Electric Co., Ltd.

Stoke-on-Trent.—City Council. Recommended. Provision of electrical installations at Mill Hill residential accommodation (£1,413).—L. R. Alcock.

WORK IN PROSPECT

Particulars of new works and building schemes for the use of electrical installation contractors and traders. Publication in this section is no guarantee that electrical work is definitely included. Alleged inaccuracies should be reported to the Editors.

Blyth.—Showrooms, Bowes Street, for Hardy & Co., Clayton Road, Newcastle; C. Solomon, architect, 30, St. Mary's Place, Newcastle-on-Tyne.

Brentford.—Factory extension; Macleans, Ltd., Great West Road.

Brighton.—Factory for Brighton Service Plating Co., Ltd., Lower Bevendean area, Brighton; town clerk.

Factory for "Elizabeth English" Shoes, Ltd.; McKellar & Westerman, Ltd.

Houses (186), South Woodingdean estate; Knight Bros. (Brighton), Ltd.

Houses (29) and garages (12), Fernhurst Close; borough engineer and surveyor, Town Hall.

Bury.—Construction of Brandlesholme C.P. School (to commence in 1954); borough engineer.

Chesterfield.—Secondary school, Newbold (1954/55 building programme); Wilcockson & Cutts, architects, Chesterfield.

Cockermouth.—Flats on site of old workhouse for U.D.C.; M. M. Dixon, surveyor, Town Hall.

Daventry.—Houses (33); H. Bonsor, R.D.C. surveyor, 44, High Street.

Derby.—Villa unit for 40 patients at Kingsway Hospital; Sheffield Regional Hospital Board, Fulwood House, Old Fulwood Road, Sheffield.

Dublin.—Grain silos; L. G. Mouchel & Partners, consulting engineers, 38, Victoria Street, S.W.1.

Dumfries.—Houses (45), Summerhill; burgh surveyor, Municipal Chambers, Buccleuch Street.

East Barnet.—Two groups of 15 and 17 houses at Brunswick Park Road; U.D.C. surveyor, Town Hall, Station Road, New Barnet.

Gateshead.—Blocks of flats, Barn Close estate; borough surveyor.

Glasgow.—Shipyard reconstruction scheme (preliminary work £500,000); Barclay, Curle & Co., shipbuilders, Clydeholme, Whiteinch, Glasgow.

Harpenden.—Houses (56), Batford (South) estate; John H. Leech, architect, Public Hall.

Helston.—Two-bay fire station in New Road; S. Gregson, Cornwall county architect, County Hall, Truro.

Liverpool.—Knitting factory at Vale Road for Howard Ford & Co., Ltd.; W. V. Hogarth, architect, 9a, North Drive.

London. — DULWICH. — Shops and flats, Croxted Road; W. J. Mitchell & Son, Ltd., 88, Dulwich Village, S.E.21.

ISLINGTON.—Flats (239) Whadcoat Street, Dame Street and Basire Street; borough engineer.

Lowestoft.—Physiotherapy department for General Hospital; East Anglian Regional Hospital Board, 33, Parkside, Cambridge.

Lydd.—Houses (50), The Green; C. E. Wingfield, town clerk, Town Hall, New Romney, Kent.

Newcastle-on-Tyne.—Second stage of plan for £600,000 Rutherford College of Technology; city architect, 18, Cloth Market.

Nottingham.—Reconstruction works at City Hospital; Sheffield Regional Hospital Board, Old Fulwood Road, Sheffield.

Oundle and Thrapston.—Houses (20), Nassington; Council's architect, Oundle, Northants.

Peterborough. — Crematorium, Marholm (£30,000); city architect, Bridge Street.

Plymouth.—Flats (72), Pembroke Street, Devonport; re-erection of Central Library, Tavistock Road; and catering annexe to Technical College of Housecraft, Portland Square; city architect.

Portsmouth.—Courts of Justice; J. Parkin, city engineer, Clarence Parade, Southsea.

Potters Bar.—Block of shops and flats; C. Miskin & Son, Ltd., Romelands, St. Albans.

Scarborough. — Factory for Sportocraft, Ltd., Castle Road.

Factory in Seamer Road for Quartons, Ltd.; Wilkinson, Smith & Brittlebank, architects, Martins Bank Chambers, Westborough, Scarborough.

Southampton.—Old people's homes (44) and communal block at Harefield; borough engineer, Civic Centre.

South Shields.—Rebuilding engine works for J. Readhead & Sons; L. J. Couves & Partners, Carliol House, Newcastle-on-Tyne.

Factory at Mill Dam for J. Newman & Co., Ltd.; Ballard, Cotton & Blow, Haymarket House, Newcastle-on-Tyne.

Stowmarket.—Dwellings (142), Chilton Hall estate; R. A. Bailey, clerk to U.D.C., Council Offices, Ipswich Road.

Sunderland.—Primary infants' school, Hylton Red House estate; borough architect, Grange House, Stockton Road.

Swansea.—Science building for University College of Swansea; clerk to the governors.

Tottenham.—Flats and maisonnettes (42), West Green Road; borough engineer.

Tynemouth.—Changing and washing rooms, canteen and offices, Low Lights, North Shields for North Shields Fish Meal & Oil Co., Ltd.; Tasker & Child, architects, 25, New Bridge Street, Newcastle-on-Tyne.

Church and church hall, Billy Mill Lane; G. E. Charlewood, architect, 14, Neville Street, Newcastle-on-Tyne.

Factory, offices, canteen and assembly shop for Albert Edward Dock Sawmills, Ltd.; J. W. Taylor & Son, architects, Gallowgate, Newcastle-on-Tyne.

Wakefield.—Scheme for rebuilding commercial premises, etc., at Kirkgate; city engineer, Town Hall.

Warrington.—Church and Sunday school at Orford estate; C. D. McIntosh, architect, 12, Winmarleigh Street.